

BASIC
(REV. A)

BINARY TAPE	20392-60001
SOURCE TAPES	20392-80001 20392-80002 20392-80003 20392-80004 20392-80005 20392-80006 20392-80007 20392-80008 20392-80009 20392-80010 20392-80011
SOURCE LISTING	20392-90001

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ASPB,A,B,L,T

BASIC LANGUAGE -- JANUARY 1, 1970

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.7	000331
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.10	000334
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.48	000357
.49	000360
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.63	000362
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.72	000366

.74	000367
.75	000370
N	000371
S	000372
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B177	000374
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B776	000400
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B1000	000402
B2000	000403
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.FSB1	007362
UNPAK	007366
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.FDV1	007543
.FDV2	007546
DBYZR	007547
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SSYMT	007620
SYMT1	007648
SYMT2	007647
SYMT4	007667
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RCERR	010001
EBUFF	010007
EUFF	010013
LBUFF	010015
LNBFF	010022
PDFT	010024
NUMOT	010040
NS1	010052
NS2	010055
NUM01	010101
NUM02	010110
NUM05	010127
NUM03	010135
EOUT2	010153
EOUT3	010164
EOUT4	010175
EOUT6	010213
EOUT5	010217
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A1	006074
A2	006105
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ESIN	010647
PAST	010702
TOPI	010717
MM4	010721
COEF1	010723
ERND	010736
ESQR	010765
SQRER	010771
BTH2	011005
SBOX	011032
ODD	011034
SA1	011045
SA2	011047
SB1	011051
SB2	011053
EINT	011055
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.LOG	011072
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EMA10	011701
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REDIM	011732
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LOOP	012013
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LCHK6	012067
LCHK5	012100
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LINV2	012551
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LINV8	012602
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LIN13	012740
LIN14	012752
LINV4	012760
LINV5	013006
LIN15	013033
LIN18	013040
LIN17	013062
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T3	013115
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** NO ERRORS*	

BASE PAGE LINKS AND CONSTANTS

BASE PAGE SUBROUTINES

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0003	00077	ORG 77B	
0004		SUP PRESS MULTIPLE OPERAND PRINTING	
0005	00077 102077	HLT 77B	CHANGED TO JSB 107B,I BY 'BOSS'
0006*			
0007**		ENTRY POINT FOR CONFIGURED BASIC	
0008*			
0009	00100 124201	JMP START,I	
0010*			
0011	00101 000000	PREAD BSS 1	PHOTO READER LINK
0012	00102 000000	WRITE BSS 1	TTY OUTPUT LINK
0013	00103 000000	PUNCH BSS 1	PUNCH LINK
0014	00104 000000	REED BSS 1	KEYBOARD LINK
0015	00105 002200	DEF STOP	STOP LINK
0016	00106 000000	LWEM BSS 1	LAST WORD OF AVAILABLE MEMORY
0017	00107 000000	BSS 1	'BOSS' DRIVER LINKAGE
0018	00110 013142	FWAM DEF FINIS	FIRST WORD OF AVAILABLE MEMORY
0019	00111 000000	LWAM BSS 1	LAST WORD OF AVAILABLE MEMORY
0020	00112 000000	PBUFF BSS 1	FIRST WORD OF USERS PROGRAM
0021	00113 000000	PBPTR BSS 1	LAST WORD+1 OF USER'S PROGRAM
0022	00114 001734	FWABP DEF FINBP	FIRST WORD AVAILABLE BASE PAGE
0023	00115 000000	FCORE BSS 1	START OF FREE CORE
0024	00116 000000	SYMTF BSS 1	START OF SYMBOL TABLE
0025	00117 000000	SYMTA BSS 1	SYMBOL TABLE END
0026	00120 000000	LSTAK BSS 1	LOW-CORE STACK ADDRESS
0027	00121 013142	ASBTB DEF FINIS	START OF CALL LINKAGE TABLE
0028	00122 013142	SBTBE DEF FINIS	LAST WORD +1 OF CALL TABLE
0029	00123 000000	IMOFF BSS 1	LINK TO INTERRUPT OFF
0030	00124 000000	IMCN BSS 1	LINK TO INTERRUPT ON
0031	00125 000000	TLINK BSS 1	TTY INTERRUPT LINK
0032	00126 100103	PLSTR DEF PUNCH,I	
0033	00127 100102	LISTR DEF WRITE,I	LIST DEVICE REFERENCE
0034	00130 100102	TLSTR DEF WRITE,I	JSB,I
0035	00131 000000	.BLFA BSS 1	I/O BUFFER ADDRESS
0036	00132 000000	BACDR BSS 1	I/O BUFFER
0037	00133 000000	CCNT BSS 1	POINTERS
0038	00134 000000	SBLFA BSS 1	SYNTAX BUFFER ADDRESS
0039	00135 000000	SBPTR BSS 1	SYNTAX BUFFER POINTER
0040	00136 000000	TFLAG BSS 1	
0041	00137 000000	TTYFL BSS 1	
0042	00140 000000	TSTPT BSS 1	TEMPORARY STACK POINTER
0043	00141 000000	LSTPT BSS 1	LOW-CORE STACK POINTER
0044	00142 000000	HSTPT BSS 1	HIGH-CORE STACK POINTER
0045	00143 000000	PRADD BSS 1	PROGRAM EXECUTION
0046	00144 000000	NXTST BSS 1	SEQUENCING INFORMATION
0047	00145 000000	.LNUM BSS 1	CURRENT LINE NUMBER
0048	00146 000000	TYPE BSS 1	CURRENT STATEMENT TYPE
0049	00147 000000	DSTRT BSS 1	DATA
0050	00150 000000	NXTDT BSS 1	STATEMENT
0051	00151 000000	DCCNT BSS 1	POINTERS
0052	00152 000000	RSYM BSS 1	
0053	00153 000000	SIGN BSS 1	
0054	00154 000000	EXP BSS 1	RANDOM
0055	00155 000000	XH BSS 1	VARIABLE
0056	00156 000000	XL BSS 1	TEMPORARIES
0057	00157 000000	TEMPS BSS 12	

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0058	00171	MLBX1	EQU	TEMPS+10
0059	00173	000000	B1	BSS 2
0060	00175	000000	B2	BSS 2
0061	00177	000000	B3	BSS 2

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0063	00201	002010	START	DEF	ENTRY	INITIATE BASIC SYSTEM
0064	00202	005137	RUNA	DEF	MFASE	PHASE 2: BUILD SYMBOL TABLE
0065	00203	006006	FASE3	DEF	XEC	PHASE 3: PROGRAM EXECUTION
0066	00204	002041	PEXMA	DEF	PEXMK	RETURN TO MONITOR FROM SYNTAX
0067	00205	002027	RDYDA	DEF	RDYPT	RETURN TO MONITOR FROM PHASE 3
0068	00206	002121	DRGSA	DEF	DRQST	REQUEST INPUT DATA
0069	00207	004572	LISTA	DEF	LIST	LIST OR PUNCH PROGRAM
0070	00210	004110	x MATA	DEF	MAT+1	MAT ENTRY IN PRINT-NAME TABLE
0071	00211	011456	EMATA	DEF	EMAT	FIRST WORD OF MATRIX EXECUTION
0072	00212	004223	TSRCH	DEF	TBSRH	SEARCH PRINT-NAME TABLE
0073	00213	004513	FNDPA	DEF	FNDPS	LOCATE STATEMENT SPECIFIED BY *
0074	00214	000567	CNSTA	DEF	CONST	SIGNED ASCII TO BINARY
0075	00215	000615	NUMCA	DEF	NUMCK	UNSIGNED ASCII TO BINARY
0076	00216	004351	INCHK	DEF	INTCK	ASCII TO INTEGER CONVERSION
0077	00217	001643	ENCTA	DEF	ENOUT	SIGNED BINARY NUMBER TO ASCII
0078	00220	010040	NUMOA	DEF	NUMOT	UNSIGNED BINARY NUMBER TO ASCII
0079	00221	004333	PGINT	DEF	PRGIN	FETCH PROGRAM INTEGER
0080	00222	005015	OUTIA	DEF	OUTIN	INTEGER TO ASCII CONVERSION
0081	00223	005055	OUTSA	DEF	OUTST	STRING TO BUFFER
0082	00224	001677	OUTLA	DEF	OUTLN	DUMP PRINT BUFFER WITH CR/LF
0083	00225	001715	OUTCA	DEF	OUTCR	PUT CHARACTER INTO PRINT BUFFER
0084	00226	001614	GETCA	DEF	GETCR	FETCH NEXT NON-BLANK CHARACTER
0085	00227	001570	DIGCA	DEF	DIGCK	SEE IF CHARACTER IS A DIGIT
0086	00230	001603	LETCA	DEF	LETCK	SEE IF CHARACTER IS A LETTER
0087	00231	007620	SSYMA	DEF	SSYMT	SEARCH SYMBOL TABLE FOR SYMBOL
0088	00232	006064	FETCA	DEF	FETCH	EVALUATE FORMULA & RETURN VALUE
0089	00233	005544	FORMA	DEF	FORMX	EVALUATE FORMULA
0090	00234	011072	.LCGA	DEF	.LOG	TAKE NATURAL LOG OF ARGUMENT
0091	00235	011201	.EXPA	DEF	.EXP	COMPUTE EXPONENTIAL OF ARGUMENT
0092	00236	007343	.FADA	DEF	.FAD	FLOATING ADD
0093	00237	007347	.FSBA	DEF	.FSB	FLOATING SUBTRACT
0094	00240	007416	.FMPA	DEF	.FMP	FLOATING MULTIPLY
0095	00241	007463	.FDVA	DEF	.FDV	FLOATING DIVIDE
0096	00242	001423	ARINA	DEF	ARINV	NEGATE FLOATING NUMBER
0097	00243	001236	MPYA	DEF	NPY	INTEGER MULTIPLY
0098	00244	001456	FLLNA	DEF	.FLUN	UNPACK FLOATING NUMBER
0099	00245	001020	PACKA	DEF	.PACK	PACK FLOATING NUMBER
0100	00246	011432	FLT	DEF	FLOAT	16-BIT INTEGER TO FLOATING
0101	00247	001364	IFIXA	DEF	IFIX	FLOATING TO INTEGER (TRUNCATION)
0102	00250	006456	PRNIA	DEF	PRNIN	INITIALIZE PRINT BUFFER
0103	00251	004410	CHRSA	DEF	CHRST	
0104	00252	004447	ACCS1	DEF	ACTST	
0105	00253	004437	DELST	DEF	DLSTM	
0106	00254	006126	FDAT	DEF	FDATA	
0107	00255	012045	LCK2A	DEF	LCHK2	
0108	00256	006044	XEC4A	DEF	XEC4	
0109	00257	003317	FSC1A	DEF	FSC14	
0110	00260	005547	FOR1A	DEF	FORM1	
0111	00261	005612	FOR0A	DEF	FORM0	
0112	00262	005617	FOR0B	DEF	FOR11	
0113	00263	005626	FOR1B	DEF	FOR10	
0114	00264	005714	FR12A	DEF	FOR12	
0115	00265	014477	EOF	JSB	ERROR	
0116	00266	014477	NOEOF	JSB	ERROR	
0117	00267	001525	E8M1A	DEF	E8-1	
0118	00270	002360	ESYN3	DEF	SYNE3-1	

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0119	00271	003401	FSCEF	DEF	FSCE4
0120	00272	006757	E6P1A	DEF	E6-1
0121	00273	010007	EBLFA	DEF	EBUFF
0122	00274	010012	EBFA	DEF	EBFF-1
0123	00275	010015	LBUFA	DEF	LBUFF
0124	00276	010021	LNBFA	DEF	LNBFF-1
0125	00277	007700	ERBS	DEF	ERR-1
0126	00300	000100	RECER	DEF	RCERR-ERR
0127	00301	002255	FOPBS	DEF	QUOTE-2
0128	00302	103035	STBAS	DEF	SYNTB-26,I
0129	00303	105727	XECBR	DEF	XECTB-26,I
0130	00304	106655	ARBAS	DEF	AROTB-6,I
0131	00305	010023	PDFBS	DEF	PDFT-1
0132	00306	003755	TBLAD	DEF	SYCMD
0133	00307	004006	STTYP	DEF	LET
0134	00310	004067	MATIO	DEF	READ
0135	00311	004125	MCBOP	DEF	AND
0136	00312	004143	PDFNS	DEF	SIN
0137	00313	004204	^x MATFN	DEF	ZER
0138	00314	004035	ANEXT	DEF	NEXT
0139	00315	004064	ADATA	DEF	DATA
0140	00316	004112	ATHEN	DEF	THEN
0141	00317	004115	ATC	DEF	TO
0142	00320	004117	ASTEP	DEF	STEP
0143	00321	004122	ANCT	DEF	NOT
0144	00322	004140	ATAB	DEF	TAB
0145	00323	000171	MBXL	DEF	MLBX1

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0147	00324	000001	.1	DEC	1
0148	00325	000002	.2	DEC	2
0149	00326	000003	.3	DEC	3
0150	00327	000004	.4	DEC	4
0151	00330	000006	.6	DEC	6
0152	00331	000007	.7	DEC	7
0153	00332	000010	.8	DEC	8
0154	00333	000011	.9	DEC	9
0155	00334	000012	.10	DEC	10
0156	00335	000014	.12	DEC	12
0157	00336	000017	.15	DEC	15
0158	00337	000027	.23	DEC	23
0159	00340	000032	.26	DEC	26
0160	00341	000033	.27	DEC	27
0161	00342	000034	.28	DEC	28
0162	00343	000036	.30	DEC	30
0163	00344	000037	.31	DEC	31
0164	00345	000040	.32	DEC	32
0165	00346	000041	.33	DEC	33
0166	00347	000042	.34	DEC	34
0167	00350	000045	.37	DEC	37
0168	00351	000050	.40	DEC	40
0169	00352	000051	.41	DEC	41
0170	00353	000053	.43	DEC	43
0171	00354	000055	.45	DEC	45
0172	00355	000056	.46	DEC	46
0173	00356	000057	.47	DEC	47
0174	00357	000060	.48	DEC	48
0175	00360	000061	.49	DEC	49
0176	00361	000072	.58	DEC	58
0177	00362	000077	.63	DEC	63
0178	00363	000100	B100	OCT	100
0179	00364	000105	E	OCT	105
0180	00365	000106	F	OCT	106
0181	00366	000110	.72	DEC	72
0182	00367	000112	.74	DEC	74
0183	00370	000113	.75	DEC	75
0184	00371	000116	N	OCT	116
0185	00372	000123	S	OCT	123
0186	00373	000133	B133	OCT	133
0187	00374	000177	B177	OCT	177
0188	00375	000200	B200	OCT	200
0189	00376	000377	MSK0	OCT	377
0190	00377	000400	B400	OCT	400
0191	00400	000776	B776	OCT	776
0192	00401	000777	MSK1	OCT	777
0193	00402	001000	B1000	OCT	1000
0194	00403	002000	B2000	OCT	2000
0195	00404	003000	B3000	OCT	3000
0196	00405	003002	SCCNT	OCT	3002
0197	00406	004000	B4000	OCT	4000
0198	00407	005000	LF	OCT	5000
0199	00410	014000	B1400	OCT	14000
0200	00411	021000	UNMNC	OCT	21000
0201	00412	022000	B2200	OCT	22000
0202	00413	023000	B2300	OCT	23000

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0203	00414	035000	DEFOP	OCT	35000
0204	00415	036000	REMOP	OCT	36000
0205	00416	052000	RDCP	OCT	52000
0206	00417	063146	TENTH	OCT	63146
0207	00420	077000	OPMSK	OCT	77000
0208	00421	077600	MSK4	OCT	77600
0209	00422	077777	INF	OCT	77777
0210	00423	100017	TYPFLL	OCT	100017
0211	00424	100037	TABCN	OCT	100037
0212	00425	100777	OPDMK	OCT	100777
0213	00426	130000	RMODE	OCT	130000
0214	00427	140000	UNARM	OCT	140000
0215	00430	174000	HIMSK	OCT	174000
0216	00431	177777	M1	DEC	-1
0217	00432	177776	M2	DEC	-2
0218	00433	177775	M3	DEC	-3
0219	00434	177774	M4	DEC	-4
0220	00435	177773	M5	DEC	-5
0221	00436	177772	M6	DEC	-6
0222	00437	177771	M7	DEC	-7
0223	00440	177770	M8	DEC	-8
0224	00441	177767	M9	DEC	-9
0225	00442	177766	M10	DEC	-10
0226	00443	177765	M11	DEC	-11
0227	00444	177761	M15	DEC	-15
0228	00445	177760	M16	DEC	-16
0229	00446	177753	M21	DEC	-21
0230	00447	177747	M25	DEC	-25
0231	00450	177740	M32	DEC	-32
0232	00451	177725	D53	OCT	-53
0233	00452	177706	D72	OCT	-72
0234	00453	177700	D100	OCT	-100
0235	00454	177670	M72	DEC	-72
0236	00455	177667	M73	DEC	-73
0237	00456	177664	M76	DEC	-76
0238	00457	177645	D133	OCT	-133
0239	00460	177400	M256	DEC	-256
0240	00461	177312	M310	DEC	-310
0241	00462	176030	M1000	DEC	-1000
0242	00463	154360	MAXSN	DEC	-10000
0243	00437		MSK3	EQU	M7
0244	00464	043116	FN	ASC	1, FN
0245	00465	037440	QMARK	ASC	1, ?
0246	00466	040000	HALF	OCT	40000
0247	00467	000000		OCT	0
0248	00466		HONE	EQU	HALF
0249	00470	100000	MNEG	OCT	100000
0250	00471	000376		OCT	376
0251	00470		FLGBT	EQU	MNEG
0252	00472	102756	MAXFX	DEC	-999999.5
0253	00474	114631	MINFX	DEC	-0.099999959
0254	00476	000040	BLANK	OCT	40

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0256**
0257*** EMIT ERROR MESSAGE **
0258**

0259 00477 000000  ERROR NOP
0260 00500 060130      LDA TLSTR      SHIFT TO
0261 00501 070127      STA LISTR      COMMAND MODE
0262 00502 060133      LDA CCNT       SAVE
0263 00503 071515      STA OPCHK      OUTPUT
0264 00504 060132      LDA BADDR      BUFFER
0265 00505 071536      STA RSCHK      POINTERS
0266 00506 060274      LDA EBFA       SET BUFFER
0267 00507 070132      STA BADDR      POINTER
0268 00510 060332      LDA .8        SET CHARACTER
0269 00511 070133      STA CCNT       COUNT
0270 00512 064477      LDB ERROR      ERROR SOURCE IN (B)
0271 00513 060277      LDA ERBS       ERROR ADDRESS IN (A)
0272 00514 002004      INA          MOVE TO NEXT ERROR
0273 00515 154000      CPB 0,I      SAME AS ACTUAL ERROR?
0274 00516 003005      CMA,INA,RSS   YES
0275 00517 024514      JMP *-3      NO
0276 00520 040277      ADA ERBS      COMPUTE ERROR
0277 00521 071643      STA ENOUT     SAVE NEGATIVE OF ERROR
0278 00522 003004      CMA,INA      NUMBER
0279 00523 114222      JSB OUTIA,I   NUMBER TO BUFFER
0280 00524 064273      LDB EBUFA     LOAD BUFFER ADDRESS
0281 00525 060133      LDA CCNT      LOAD NEGATIVE OF
0282 00526 003004      CMA,INA      CHARACTER COUNT
0283 00527 114102      JSB WRITE,I   OUTPUT ERROR MESSAGE
0284 00530 060276      LDA LNBFA     OUTPUT
0285 00531 070132      STA BADDR
0286 00532 060334      LDA .10
0287 00533 070133      STA CCNT      LINE
0288 00534 060145      LDA .LNUM
0289 00535 114222      JSB OUTIA,I
0290 00536 064275      LDB LBUFA     NUMBER
0291 00537 060133      LDA CCNT
0292 00540 114102      JSB WRITE,I
0293 00541 061643      LDA ENOUT     RETRIEVE NEGATIVE OF ERROR
0294 00542 040300      ADA RECER     RECOVERABLE
0295 00543 002021      SSA,RSS      ERROR?
0296 00544 124204      JMP PEXMA,I   NO, RETURN TO SYNTAX MODE
0297 00545 060426      LDA RMODE     RETURN TO
0298 00546 070127      STA LISTR     RUN MODE
0299 00547 061515      LDA OPCHK     RESTORE
0300 00550 070133      STA CCNT      OUTPUT
0301 00551 061536      LDA RSCHK     BUFFER
0302 00552 070132      STA BADDR     POINTERS
0303 00553 124477      JMP ERROR,I  RETURN TO PROGRAM

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0305**

0306*** MOVE WORDS TO HIGHER CORE **

0307**

0308	00554	000000	MVTOH	NOP	
0309	00555	064162	LDB	TEMP2	FETCH SOURCE ADDRESS
0310	00556	054163	MVT01	CPB TEMP3	ALL RELOCATION DONE?
0311	00557	124554	JMP	MVTOH, I	YES, EXIT
0312	00560	003400	CCA		BACK UP
0313	00561	040164	ADA	TEMP4	SOURCE AND
0314	00562	070164	STA	TEMP4	DESTINATION
0315	00563	044431	ADB	M1	ADDRESSES
0316	00564	160001	LDA	1,I	MOVE
0317	00565	170164	STA	TEMP4, I	WORD
0318	00566	024556	JMP	MVT01	

0319**

0320*** INPUT A CONSTANT **

0321**

0322	00567	000000	CONST	NOP	
0323	00570	015614	JSB	GETCR	
0324	00571	124567	JMP	CONST, I	
0325	00572	006400	CLB		SET SIGN
0326	00573	074153	STB	SIGN	POSITIVE
0327	00574	006004	INB		
0328	00575	050353	CPA	.43	'+' ?
0329	00576	024602	JMP	CONS1	YES
0330	00577	050354	CPA	.45	NO, '-' ?
0331	00600	007401	CCB, RSS		YES
0332	00601	024605	JMP	CONS2	NO
0333	00602	074153	CONS1	STB	RECORD SIGN
0334	00603	015614	JSB	GETCR	FETCH NEXT
0335	00604	024613	JMP	SYE12-1	CHARACTER
0336	00605	014615	CONS2	JSB	FETCH CONSTANT
0337	00606	024611	JSB	NUMCK	NONE FOUND
0338	00607	034567	JMP	CONS3	SUCCESSFULLY FOUND,
0339	00610	124567	JSB	CONST, I	EXIT VIA (P+2)
0340	00611	054153	CONS3	CPB	SIGN FOUND? ((B) = 0)
0341	00612	003401	CCA, RSS		NO
0342	00613	014477	JSB	ERROR	YES, SOLITARY SIGN
0343	00614	124567	SYE12	JMP CONST, I	EXIT VIA (P+1)

0344**

0345*** FETCH NUMBER AND CONVERT TO BINARY **

0346**

0347	00615	000000	NUMCK	NOP	CHARACTER IN (A), SIGN SET
0348	00616	006400	CLB		
0349	00617	074154	STB	EXP	ZERO
0350	00620	075274	STB	MANT1	ALL
0351	00621	075336	STB	MANT2	COMPONENTS
0352	00622	075603	STB	EXPON	OF NUMBER
0353	00623	074163	STB	TEMP3	SET 'NUMBER' FLAG FALSE
0354	00624	007400	CCB		SET 'DECIMAL POINT'
0355	00625	075633	STB	DPFLG	FLAG FALSE
0356	00626	050355	NUMC1	CPA	DECIMAL POINT?
0357	00627	035633	ISZ	DPFLG	YES, SET FLAG TRUE
0358	00630	024634	JMP	NUMC2	NO
0359	00631	002400	CLA		INITIALIZE POST-DECIMAL DIGIT
0360	00632	071603	STA	EXPON	DIGIT COUNTER TO ZERO

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0361	00633	024653	JMP NUMC2	FETCH A CHARACTER
0362	00634	015570	JSB DIGCK	DIGIT?
0363	00635	024706	JMP NUMC7	NO
0364	00636	035603	ISZ EXPON	YES, COUNT DIGIT
0365	00637	001727	ALF,ALF	LEFT-JUSTIFY
0366	00640	001723	ALF,RAR	DIGIT AND
0367	00641	070164	STA TEMP4	SAVE IT
0368	00642	015147	JSB MBY10	MULTIPLY PREVIOUS NUMBER BY 10
0369	00643	064154	LDB EXP	
0370	00644	006002	SZB	ZERO EXPONENT?
0371	00645	024657	JMP NUMC4	NO
0372	00646	060327	LDA .4	YES, SET
0373	00647	070154	STA EXP	EXPONENT TO 4
0374	00650	060164	LDA TEMP4	LOAD
0375	00651	006400	CLB	NUMBER
0376	00652	015113	NUMC3 JSB NORML	NORMALIZE THE NUMBER
0377	00653	034163	ISZ TEMP3	SET 'NUMBER OCCURRED' FLAG
0378	00654	015614	JSB GETCR	ANOTHER CHARACTER?
0379	00655	024755	JMP NUM12	NO
0380	00656	024626	JMP NUMC1	YES
0381	00657	044434	NUMC4 ADB M4	COMPUTE EXPONENT
0382	00660	007000	CMB	BIAS AND
0383	00661	060164	LDA TEMP4	SAVE IT
0384	00662	074164	STB TEMP4	
0385	00663	006400	CLB	
0386	00664	034164	NUMC5 ISZ TEMP4	DIGIT POSITIONED?
0387	00665	024703	JMP NUMC6	NO
0388	00666	000040	CLE	YES, ADD IN
0389	00667	045336	ADB MANT2	LOW PART
0390	00670	103101	CLO	OF NUMBER
0391	00671	002040	SEZ	OVERFLOW?
0392	00672	002004	INA	YES, BUMP (A)
0393	00673	041274	ADA MANT1	ADD IN HIGH PART OF NUMBER
0394	00674	102301	SOS	OVERFLOW?
0395	00675	024652	JMP NUMC3	NO
0396	00676	000065	CLE,ERA	YES, ROTATE
0397	00677	005500	ERB	DOWN AND
0398	00700	034154	ISZ EXP	BUMP
0399	00701	000000	NOP	EXPONENT
0400	00702	024652	JMP NUMC3	
0401	00703	000065	NUMC6 CLE,ERA	SHIFT
0402	00704	005500	ERB	DIGIT
0403	00705	024664	JMP NUMC5	RIGHT
0404	00706	006400	NUMC7 CLB	DECIMAL POINT
0405	00707	074164	STB TEMP4	OR DIGIT FOUND?
0406	00710	054163	CPB TEMP3	NO, EXIT VIA (P+1)
0407	00711	124615	JMP NUMCK,I	YES, 'E' ?
0408	00712	050364	CPA E	YES
0409	00713	002001	RSS	NO, NO EXPONENT PART
0410	00714	024755	JMP NUM12	
0411	00715	015614	JSB GETCR	
0412	00716	014477	NUMER JSB ERROR	'+' ?
0413	00717	050353	CPA .43	YES
0414	00720	024725	JMP NUMC8	NO, '-' ?
0415	00721	050354	CPA .45	
0416	00722	003401	CCA,RSS	YES

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0417	00723	024727	JMP	NUMC9	NO
0418	00724	070164	STA	TEMP4	NOTE MINUS SIGN
0419	00725	015614	NUMC8	JSB GETCR	
0420	00726	024716	JMP	NUMER	
0421	00727	015570	NUMC9	JSB DIGCK	DIGIT?
0422	00730	024716	JMP	NUMER	NO
0423	00731	070163	STA	TEMP3	YES, SAVE IT
0424	00732	015614	JSB	GETCR	
0425	00733	024751	JMP	NUM10	SECOND
0426	00734	015570	JSB	DIGCK	DIGIT?
0427	00735	024751	JMP	NUM10	NO
0428	00736	064163	LDB	TEMP3	YES
0429	00737	005020	BLS,BLS		MULTIPLY
0430	00740	044163	ADB	TEMP3	PRIOR DIGIT
0431	00741	005000	BLS		BY 10
0432	00742	040001	ADA	1	ADD NEW DIGIT
0433	00743	070163	STA	TEMP3	SAVE EXPONENT
0434	00744	015614	JSB	GETCR	
0435	00745	024751	JMP	NUM10	THIRD
0436	00746	015570	JSB	DIGCK	DIGIT?
0437	00747	002001	RSS		NO
0438	00750	024716	JMP	NUMER	YES
0439	00751	060163	NUM10	LDA TEMP3	LOAD EXPONENT
0440	00752	034164		ISZ TEMP4	POSITIVE?
0441	00753	003004		CMA,INA	YES, COMPLEMENT IT
0442	00754	002001		RSS	NO
0443	00755	002400	NUM12	CLA	CLEAR IF NO EXPONENT PART
0444	00756	035633		ISZ DPFLG	DECIMAL POINT?
0445	00757	041603		ADA EXPON	YES, CORRECT EXPONENT
0446	00760	002003		SZA,RSS	ZERO EXPONENT?
0447	00761	024776		JMP NUM14	YES
0448	00762	002020		SSA	NO, NEGATIVE EXPONENT?
0449	00763	024772		JMP NUM13	NO
0450	00764	003004		CMA,INA	YES, SET
0451	00765	071603		STA EXPON	COUNTER
0452	00766	015200		JSB DBY10	DIVIDE NUMBER BY 10
0453	00767	035603		ISZ EXPON	DONE?
0454	00770	024766		JMP **-2	NO
0455	00771	024776		JMP NUM14	YES
0456	00772	071603	NUM13	STA EXPON	SET COUNTER
0457	00773	015147		JSB MBY10	MULTIPLY BY 10
0458	00774	035603		ISZ EXPON	DONE?
0459	00775	024773		JMP **-2	NO
0460	00776	061274	NUM14	LDA MANT1	YES, LOAD
0461	00777	065336		LDB MANT2	NUMBER
0462	01000	034153		ISZ SIGN	POSITIVE?
0463	01001	025005		JMP NUM15	YES
0464	01002	003000		CMA	NO,
0465	01003	007007		CMB,INB,SZB,RSS	COMPLEMENT
0466	01004	002004		INA	IT
0467	01005	015020	NUM15	JSB .PACK	PACK NUMBER INTO (A) AND (B)
0468	01006	034135		ISZ SBPTR	
0469	01007	170135		STA SBPTR,I	STORE
0470	01010	034135		ISZ SBPTR	NUMBER IN
0471	01011	174135		STB SBPTR,I	PROPER
0472	01012	034135		ISZ SBPTR	LOCATION

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0473	01013	015633	JSB	BCKSP	FETCH
0474	01014	015614	JSB	GETCR	FIRST
0475	01015	060334	LDA	.10	UNUSED CHARACTER
0476	01016	034615	ISZ	NUMCK	RETURN
0477	01017	124615	JMP	NUMCK,I	VIA (P+2)

0478**

0479*** NORMALIZE AND PACK FLOATING POINT NUMBER **

0480**

0481	01020	000000	.PACK	NOP	MANTISSA IN (A) AND (B),
0482	01021	015113	JSB	NORML	EXONENT IN EXP, (E) CLEARED
0483	01022	002103	CLE	,SZA,RSS	ZERO RESULT?
0484	01023	125020	JMP	.PACK,I	YES
0485	01024	044374	ADB	B177	NO, ROUND
0486	01025	002021	SSA	,RSS	POSITIVE NUMBER?
0487	01026	006004	INB		YES, FINISH ROUND
0488	01027	103101	CLO		
0489	01030	002040	SEZ		OVERFLOW FROM (B)?
0490	01031	002104	CLE	,INA	YES, BUMP (A)
0491	01032	102301	SOS		OVERFLOW? (A=100000, B=0)
0492	01033	001200	RAL		
0493	01034	002031	SSA	,SLA,RSS	TWO HIGH BITS 1'S? (A=140000)
0494	01035	025040	JMP	PACK1	NO
0495	01036	002300	CCE		YES
0496	01037	001130	ARS	,SLA,ALS	SET (A) =100000 AND SKIP
0497	01040	001300	PACK1	RAR	COUNTERPART TO --5
0498	01041	071147	STA	MBY10	SAVE (A)
0499	01042	060001	LDA	1	DELETE 8 LOW
0500	01043	010460	AND	M256	ORDER BITS OF MANTISSA
0501	01044	070001	STA	1	SAVE LOWER MANTISSA
0502	01045	060154	LDA	EXP	FETCH EXPONENT
0503	01046	002040	SEZ		DECREMENT EXPONENT?
0504	01047	040431	ADA	M1	YES
0505	01050	102201	SOC		NO, PRIOR OVERFLOW?
0506	01051	002004	INA		YES, INCREMENT EXPONENT
0507	01052	040375	ADA	B200	NO, EXPONENT
0508	01053	002020	SSA		UNDERFLOW?
0509	01054	025073	JMP	PACK3	YES
0510	01055	040460	ADA	M256	NO, EXPONENT
0511	01056	002021	SSA	,RSS	OVERFLOW?
0512	01057	025077	JMP	PACK4	YES
0513	01060	040375	ADA	B200	NO, RESTORE EXPONENT,
0514	01061	001200	RAL		POSITION SIGN,
0515	01062	010376	AND	MSK8	MASK TO 8 BITS, AND
0516	01063	044000	ADB	0	COMBINE WITH LOW MANTISSA
0517	01064	061147	LDA	MBY10	RETRIEVE HIGH MANTISSA
0518	01065	050470	CPA	MNEG	
0519	01066	002001	RSS		NEGATIVE
0520	01067	125020	JMP	.PACK,I	
0521	01070	054471	CPB	MNEG+1	OVERFLOW?
0522	01071	025077	JMP	PACK4	YES
0523	01072	125020	JMP	.PACK,I	NO
0524	01073	014477	PACK3	JSB	ZERO RESULT
0525	01074	002400	UNDER	CLA	ON UNDERFLOW
0526	01075	006400	CLB		
0527	01076	125020	JMP	.PACK,I	
0528	01077	014477	PACK4	JSB	ERROR

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0529 01100 061147 OVRER LDA MBY10
0530 01101 015103 JSB OVFLW
0531 01102 125020 JMP .PACK,I
0532**
0533*** LOAD INFINITY ON OVERFLOW **
0534**
0535 01103 000000 OVFLW NOP
0536 01104 064432 LDB M2      LOAD APPROPRIATE
0537 01105 002020 SSA        LOW MANTISSA
0538 01106 064400 LDB B776
0539 01107 030422 IOR INF    LOAD APPROPRIATE
0540 01110 002020 SSA        HIGH MANTISSA
0541 01111 060470 LDA MNEG
0542 01112 125103 JMP OVFLW,I
0543**
0544*** NORMALIZE (A), (B), AND EXP **
0545**
0546 01113 000000 NORML NOP   SET
0547 01114 071147 STA MBY10  LEFT-SHIFT
0548 01115 002400 CLA        COUNTER
0549 01116 071236 STA MPY    TO ZERO
0550 01117 061147 LDA MBY10
0551 01120 002003 SZA,RSS
0552 01121 006002 SZB        ON ZERO
0553 01122 025130 JMP NORM3  CLEAR EVERYTHING
0554 01123 070154 STA EXP
0555 01124 071274 STA MANT1 STORE MANTISSA
0556 01125 075336 NORM1 STB MANT2 AND RETURN
0557 01126 125113 JMP NORML,I COUNT LEFT SHIFTS
0558 01127 035236 NORM2 ISZ MPY ROTATE (A) AND
0559 01130 004066 NORM3 CLE,ELB (B) LEFT INTO (E)
0560 01131 001600 ELA        TWO HIGHEST BITS 0?
0561 01132 002061 SEZ,SSA,RSS YES, + UNNORMALIZED
0562 01133 025127 JMP NORM2 NO, TWO HIGHEST BITS 1?
0563 01134 002060 SEZ,SSA
0564 01135 025127 JMP NORM2 YES, - UNNORMALIZED
0565 01136 001500 ERA        SHIFT TO
0566 01137 005540 ERB,CLE  NORMALIZE MANTISSA
0567 01140 071274 STA MANT1 NO,
0568 01141 061236 LDA MPY COMPUTE
0569 01142 003004 CMA,INA CORRECTED
0570 01143 040154 ADA EXP EXPONENT
0571 01144 070154 STA EXP VALUE
0572 01145 061274 LDA MANT1
0573 01146 025125 JMP NORM1
0574**
0575*** MULTIPLY UNPACKED NUMBER BY 10 **
0576**
0577 01147 000000 MBY10 NOP
0578 01150 061274 LDA MANT1 RETURN ON
0579 01151 002003 SZA,RSS ZERO
0580 01152 125147 JMP MBY10,I MANTISSA
0581 01153 064154 LDB EXP MULTIPLY
0582 01154 044326 ADB .3 BY
0583 01155 074154 STB EXP 8
0584 01156 065336 LDB MANT2 LOAD MANTISSA

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0585	01157	000065	CLE,ERA	DIVIDE
0586	01160	005500	ERB	BY
0587	01161	000065	CLE,ERA	4
0588	01162	005540	ERB,CLE	
0589	01163	045336	ADB MANT2	DOUBLE
0590	01164	002040	SEZ	ADD TO
0591	01165	002004	INA	PRODUCE
0592	01166	041274	ADA MANT1	1.25 * MANTISSA
0593	01167	002021	SZA,RSS	CORRECT
0594	01170	025175	JMP **5	
0595	01171	000065	CLE,ERA	ON
0596	01172	005500	ERB	
0597	01173	034154	ISZ EXP	OVERFLOW
0598	01174	000000	NOP	
0599	01175	071274	STA MANT1	
0600	01176	075336	STB MANT2	
0601	01177	125147	JMP DBY10,I	
0602**				
0603***			DIVIDE UNPACKED NUMBER BY 10	**
0604**				
0605	01200	000000	DBY10 NOP	MULTIPLY BY DOUBLE-LENGTH TENTH
0606	01201	061274	LDA MANT1	RETURN
0607	01202	002003	SZA,RSS	ON ZERO
0608	01203	125200	JMP DBY10,I	MANTISSA
0609	01204	064432	LDB M2	ADD EXPONENT OF
0610	01205	044154	ADB EXP	'TENTH' TO
0611	01206	074154	STB EXP	MANTISSA EXPONENT
0612	01207	061336	LDA MANT2	JUSTIFY
0613	01210	000065	CLE,ERA	LOWER MANTISSA
0614	01211	015236	JSB MPY	MULTIPLY BY
0615	01212	000417	DEF TENTH	63146 (ONE-TENTH)
0616	01213	000066	CLE,ELA	SHIFT
0617	01214	005640	ELB,CLE	BACK
0618	01215	040001	ADA 1	ADD IN LOWER MANTISSA*
0619	01216	002040	SEZ	TENTH*(2) ⁻¹⁶
0620	01217	006004	INB	AND ROUND
0621	01220	075336	STB MANT2	TO 16 BITS
0622	01221	061274	LDA MANT1	DO
0623	01222	015236	JSB MPY	SAME
0624	01223	000417	DEF TENTH	FOR
0625	01224	000040	CLE	HIGH
0626	01225	040001	ADA 1	MANTISSA
0627	01226	041336	ADA MANT2	(EFFECTIVELY) SUM
0628	01227	002040	SEZ	DOUBLE-LENGTH
0629	01230	006004	INB	PRODUCTS
0630	01231	075274	STB MANT1	EXCHANGE
0631	01232	070001	STA 1	(A) AND (B)
0632	01233	061274	LDA MANT1	REGISTERS
0633	01234	015113	JSB NORML	NORMALIZE RESULT
0634	01235	125200	JMP DBY10,I	

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0001**				
0002***	MULTIPLY INTEGER IN (A) **			
0003**				
0004	01236 000000	MPY	NOP	ADDRESS OF MULTIPLIER IN MPY,I
0005	01237 064432		LDB M2	SET -2 IN
0006	01240 075147		STB MBY10	SIGN TEMP
0007	01241 165236		LDB MPY,I	LOAD
0008	01242 164001		LDB 1,I	MULTIPLIER
0009	01243 002120		CLE,SSA	(A) NEGATIVE?
0010	01244 003204		CMA,CME,INA	YES, COMPLEMENT (A) AND (E)
0011	01245 006020		SSB	(B) NEGATIVE?
0012	01246 007204		CMB,CME,INB	YES, COMPLEMENT (B) AND (E)
0013	01247 002040		SEZ	(E) = 0?
0014	01250 035147		ISZ MBY10	NO, SET SIGN OF RESULT NEGATIVE
0015	01251 075113		STB NORML	SAVE MULTIPLIER
0016	01252 064445		LDB M16	SET
0017	01253 074554		STB MVTOH	COUNTER
0018	01254 006400		CLB	ZERO PRODUCT
0019	01255 001600		ELA	BIAS (A) TO LEFT
0020	01256 001550	MPY1	ERA,CLE,SLA	SHIFT, TEST,
0021	01257 045113		ADB NORML	AND ADD UPON
0022	01260 005500		ERB	NON-ZERO BIT
0023	01261 034554		ISZ MVTOH	DONE?
0024	01262 025256		JMP MPY1	NO
0025	01263 001540		ERA,CLE	YES, ADJUST FINAL RESULT
0026	01264 035147		ISZ MBY10	NEGATIVE RESULT?
0027	01265 025271		JMP MPY2	NO
0028	01266 007100		CMB	YES,
0029	01267 003007		CMA,INA,SZA,RSS	COMPLEMENT
0030	01270 006004		INB	RESULT
0031	01271 103101	MPY2	CLO	
0032	01272 035236		ISZ MPY	
0033	01273 125236		JMP MPY,I	
0034**				
0035***	FIND AND STORE ONE-CHARACTER OPERATORS **			
0036**				

0037	01274 000000	SYMCK	NOP	CHARACTER IN (A)
0038	01275 074165		STB COUNT	- (ENTRIES TO BE SEARCHED)
0039	01276 001727		ALF,ALF	POSITION
0040	01277 030345		IOR .32	CHARACTER
0041	01300 165274		LDB SYMCK,I	STARTING TABLE ENTRY - 2
0042	01301 035274		ISZ SYMCK	SET RETURN ADDRESS
0043	01302 044325	SYMC1	ADB .2	UPDATE TABLE POINTER
0044	01303 150001		CPA 1,I	MATCH?
0045	01304 025312		JMP SYMC2	
0046	01305 034165		ISZ COUNT	NO, CONTINUE SEARCH?
0047	01306 025302		JMP SYMC1	YES
0048	01307 001727		ALF,ALF	NO, RESTORE
0049	01310 010374		AND B177	CHARACTER
0050	01311 125274		JMP SYMCK,I	AND EXIT
0051	01312 003400	SYMC2	CCA	GET
0052	01313 040001		ADA 1	INFORMATION
0053	01314 160000		LDA 0,I	WORD
0054	01315 010420		AND OPMSK	AND
0055	01316 170135		STA SBPTR,I	STORE IT
0056	01317 050410		CPA B1400	

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0057	01320	124257	JMP F8C1A,I	
0058	01321	035274	ISZ SYMCK	RETURN VIA
0059	01322	125274	JMP SYMCK,I	(P+2)
0060**				
0061**	FIND CALLED SUBROUTINE **			
0062**				
0063	01323	000000	FNDSB NOP	
0064	01324	074162	STB TEMP2	SAVE SUBROUTINE NUMBER
0065	01325	064121	LDB ASBTB	LOAD (B) WITH SUBROUTINE TABLE
0066	01326	054122	FNDS1 CPA SBTBE	END OF TABLE?
0067	01327	014477	JSB ERROR	YES
0068	01330	160001	CALER LDA 1,I	NO, EXTRACT
0069	01331	010362	AND .63	SUBROUTINE NUMBER
0070	01332	050162	CPA TEMP2	DESIRED ONE?
0071	01333	125323	JMP FNDSB,I	YES
0072	01334	044325	ADB .2	NO, MOVE TO
0073	01335	025326	JMP FNDS1	NEXT TABLE ENTRY

0075*	*****			
0076*	SUBROUTINE TO COMPUTE THE STORAGE REQUIRED BY AN			
0077*	ARRAY WHOSE PACKED DIMENSIONS ARE IN A UPON ENTRY			
0078*	*****			
0079*				
0080*	THE SUBROUTINE RETURNS IN A THE NUMBER OF LOCATIONS			
0081*	REQUIRED FOR THE SPECIFIED DIMENSIONS			
0082*	= 2*DIM1*DIM2			
0083*				
0084	01336	000000	MDIM NOP	
0085	01337	070001	STA 1	STORE PACKED DIMS. TEMPORALILY
0086	01340	010376	AND MSK0	
0087	01341	071456	STA .FLUN	STORE # OF COLUMNS
0088	01342	060001	LDA 1	
0089	01343	001727	ALF,ALF	
0090	01344	010376	AND MSK0	A = # OF ROWS
0091	01345	001000	ALS	DOUBLE FOR FLOATING POINT
0092	01346	015236	JSB MPY	
0093	01347	001456	DEF .FLUN	COMPUTE 2*ROWS*COLUMNS
0094	01350	002020	SSA	RESULT < 32768 ?
0095	01351	014477	JSB ERROR	NO, ERROR, DIMENSIONS TOO LARGE
0096	01352	125336	MER9 JMP MDIM,I	YES, RETURN

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0098**
0099*** ROUND A SUBSCRIPT TO AN INTEGER **
0100**
0101*
0102* RETURNS INTEGER IN {1,32767} (BIASED BY -1)
0103* OR EXITS TO ERRCR.
0104*
0105 01353 000000 SBFIX NOP           SUBSCRIPT IN (A) AND (B)
0106 01354 015364 JSB IFIX            24-BIT INTEGER?
0107 01355 124272 JMP E6M1A,I      NO
0108 01356 002041 SEZ,RSS           YES, ROUND AND
0109 01357 044431 ADB M1             BIAS BY -1
0110 01360 002003 SZA,RSS           15-BIT
0111 01361 006020 SSB              POSITIVE INTEGER?
0112 01362 124272 JMP E6M1A,I      NO
0113 01363 125353 JMP SBFIX,I      YES
0114**
0115*** INTEGERIZE FLOATING POINT NUMBER **
0116**
0117 01364 000000 IFIX  NOP
0118 01365 102101 STO
0119 01366 071614 STA GETCR        SAVE (A)
0120 01367 015456 JSB .FLUN        EXPONENT
0121 01370 002020 SSA              NON-NEGATIVE?
0122 01371 025414 JMP IFIX3        NO
0123 01372 040445 ADA M16          YES, EXPONENT
0124 01373 002020 SSA              <= 15?
0125 01374 103101 CLO
0126 01375 040440 ADA M8           EXPONENT
0127 01376 002021 SSA,RSS         <= 23?
0128 01377 125364 JMP IFIX,I      NO, ALL SIGNIFICANCE IS INTEGER
0129 01400 040440 ADA M8           MOVE BINARY POINT TO END OF (B)
0130 01401 071456 STA ,FLUN        SAVE SHIFT COUNT
0131 01402 061614 LDA GETCR        RETRIEVE (A)
0132 01403 025410 JMP IFIX2
0133 01404 000071 IFIX1 CLE,SLA,ARS SHIFT (A) RIGHT
0134 01405 002200 CME              SHIFT (B)
0135 01406 004035 SLB,ERB          RIGHT
0136 01407 102101 STO              NOTE IF A 1 IS LOST
0137 01410 035456 IFIX2 ISZ .FLUN DONE?
0138 01411 025404 JMP IFIX1
0139 01412 035364 ISZ IFIX
0140 01413 125364 JMP IFIX,I
0141 01414 061614 IFIX3 LDA GETCR RETRIEVE (A)
0142 01415 002120 CLE,SSA        TRUNCATE
0143 01416 003401 CCA,RSS        TO
0144 01417 002401 CLA,RSS        -1
0145 01420 007401 CCB,RSS        OR
0146 01421 006400 CLB              0
0147 01422 025412 JMP IFIX2+2

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0149**			
0150*** TAKE ARITHMETIC INVERSE **			
0151**			
0152 01423 000000	ARINV	NOP	NUMBER IN (A) AND (B)
0153 01424 071677		STA OUTLN	SWAP
0154 01425 060001		LDA 1	
0155 01426 065677		LDB OUTLN	REGISTERS
0156 01427 007100		CMB,CLE	COMPLEMENT HIGH PART
0157 01430 020460		XOR M256	COMPLEMENT LOW PART
0158 01431 040377		ADA B400	ADD IN 1
0159 01432 002041		SEZ,RSS	OVERFLOW?
0160 01433 025452		JMP ARIN2	NO
0161 01434 006004		INB	YES, INCREMENT HIGH MANTISSA
0162 01435 054470		CPB FLGBT	OVERFLOW?
0163 01436 025442		JMP ARIN1	YES
0164 01437 054427		CPB UNNRM	NO, NEGATIVE UNNORMALIZED?
0165 01440 002001		RSS	YES
0166 01441 025452		JMP ARIN2	NO
0167 01442 044427	ARIN1	ADB UNNRM	FIX HIGH MANTISSA
0168 01443 000033		SLA,RAR	POSITION EXPONENT
0169 01444 030421		IOR MSK4	FILL IN BITS IF NEGATIVE
0170 01445 006021		SSB,RSS	POSITIVE?
0171 01446 002005		INA,RSS	YES, BUMP EXPONENT
0172 01447 040431		ADA M1	NO, DECREMENT EXPONENT
0173 01450 001200		RAL	POSITION
0174 01451 010376		AND MSK0	EXPOENT
0175 01452 071677	ARIN2	STA OUTLN	SWAP
0176 01453 060001		LDA 1	
0177 01454 065677		LDB OUTLN	REGISTERS
0178 01455 125423		JMP ARINV,I	
0179**			
0180*** UNPACK LOW WORD OF NUMBER **			
0181**			
0182 01456 000000	.FLUN	NOP	WORD IN (B)
0183 01457 060001		LDA 1	(A) = (B)
0184 01460 010376		AND MSK0	EXTRACT EXPONENT IN (A)
0185 01461 007000		CMB	SUBTRACT OFF
0186 01462 044000		ADB 0	EXPOENT FROM
0187 01463 007000		CMB	MANTISSA IN (B)
0188 01464 000033		SLA,RAR	NEGATIVE EXPONENT?
0189 01465 030421		IOR MSK4	YES, FILL IN LEADING BITS
0190 01466 125456		JMP .FLUN,I	NO
0191**			
0192*** STACK (B) ON LOW-CORE STACK **			
0193**			
0194 01467 000000	SLWST	NOP	
0195 01470 034141		ISZ LSTPT	ADVANCE 'LOW
0196 01471 060141		LDA LSTPT	STACK' POINTER
0197 01472 050142		CPA HSTPT	STACK OVERFLOW?
0198 01473 014477	E1	JSB ERROR	YES
0199 01474 174141		STB LSTPT,I	NO, STACK (B)
0200 01475 125467		JMP SLWST,I	

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0202**

0203*** BUMP HIGH STACK POINTER **

0204**

0205	01476	000000	BHSTP	NOP	
0206	01477	007400		CCB	ADVANCE
0207	01500	044142		ADB HSTPT	
0208	01501	074142		STB HSTPT	POINTER
0209	01502	054141		CPB LSTPT	OVERFLOW?
0210	01503	025473		JMP E1	YES
0211	01504	125476		JMP BHSTP,I	NO

0212**

0213*** FETCH TOP OF STACK **

0214**

0215	01505	000000	STTOP	NOP	
0216	01506	015515		J8B OPCHK	VALIDATE
0217	01507	015536		J8B R8CHK	OPERAND
0218	01510	164142		LDB HSTPT,I	SAVE
0219	01511	160001		LDA 1,I	LOAD
0220	01512	006004		INB	
0221	01513	164001		LDB 1,I	NUMBER
0222	01514	125505		JMP STTOP,I	

0223**

0224*** VERIFY LEGITIMACY OF OPERAND **

0225**

0226	01515	000000	OPCHK	NOP	
0227	01516	164142		LDB HSTPT,I	OPERAND ADDRESS TO (B)
0228	01517	160001		LDA 1,I	HIGH PART OF
0229	01520	050470		CPA MNEG	OPERAND 100000B?
0230	01521	006005		INB,RSS	YES
0231	01522	025527		JMP OPCH1	NO
0232	01523	160001		LDA 1,I	LOW PART
0233	01524	050471		CPA MNEG+1	776B?
0234	01525	014477		JSB ERROR	YES
0235	01526	044431	E8	ADB M1	
0236	01527	054140	OPCH1	CPB TSTPT	TEMPORARY OPERAND?
0237	01530	002001		RSS	YES
0238	01531	125515		JMP OPCHK,I	NO
0239	01532	060140		LDA TSTPT	UNSTACK
0240	01533	040432		ADA M2	THE TEMPORARY
0241	01534	070140		STA TSTPT	OPERAND
0242	01535	125515		JMP OPCHK,I	EXIT WITH ADDRESS IN (B)

0243**

0244*** ALLOT SPACE FOR INTERMEDIATE RESULT **

0245**

0246	01536	000000	RSCHK	NOP	
0247	01537	060140		LDA TSTPT	ALLOT
0248	01540	040325		ADA .2	
0249	01541	070140		STA TSTPT	SPACE
0250	01542	040431		ADA M1	OVERFLOW INTO
0251	01543	050120		CPA LSTAK	LOW-CORE STACK?
0252	01544	002001		RSS	YES
0253	01545	125536		JMP RSCHK,I	NO
0254	01546	060120		LDA LSTAK	SAVE
0255	01547	002004		INA	LOWER
0256	01550	070163		STA TEMP3	STACK BOUND
0257	01551	040333		ADA .9	UPDATE

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0258	01552	070120	STA LSTAK	STACK BOTTOM
0259	01553	060141	LDA L8TPT	SET
0260	01554	002004	INA	SOURCE
0261	01555	070162	STA TEMP2	ADDRESS
0262	01556	040333	ADA .9	UPDATE
0263	01557	070141	STA L8TPT	STACK TOP
0264	01560	002004	INA	SET DESTINATION
0265	01561	070164	STA TEMP4	ADDRESS
0266	01562	003004	CMA,INA	OVERFLOW
0267	01563	040142	ADA H8TPT	INTO
0268	01564	002020	SSA	HIGH-CORE STACK?
0269	01565	025473	JMP E1	YES
0270	01566	014554	JSB MVTOH	NO, MOVE
0271	01567	125536	JMP R8CHK,I	LOW-CORE STACK
0272**				
0273***		CHECK FOR DIGIT	**	
0274**				
0275	01570	000000	DIGCK NOP	CHARACTER IN (A)
0276	01571	064000	LDB 0	
0277	01572	044452	ADB D72	ASCII 72B
0278	01573	006021	SSB,RSS	OR GREATER?
0279	01574	125570	JMP DIGCK,I	YES, RETURN WITH CHARACTER
0280	01575	044334	ADB .10	NO, ASCII 60B
0281	01576	006020	SSB	OR GREATER?
0282	01577	125570	JMP DIGCK,I	NO
0283	01600	035570	ISZ DIGCK	YES, SET 'SUCCESS' EXIT,
0284	01601	060001	LDA 1	LOAD DIGIT INTO (A),
0285	01602	125570	JMP DIGCK,I	AND RETURN
0286**				
0287***		CHECK FOR LETTER	**	
0288**				
0289	01603	000000	LETCK NOP	CHARACTER IN (A)
0290	01604	064000	LDB 0	
0291	01605	044457	ADB D133	ASCII 133B
0292	01606	006021	SSB,RSS	OR GREATER?
0293	01607	125603	JMP LETCK,I	YES, EXIT WITH CHARACTER IN (A)
0294	01610	044340	ADB .26	NO, ASCII 101B
0295	01611	006021	SSB,RSS	OR GREATER?
0296	01612	035603	ISZ LETCK	YES
0297	01613	125603	JMP LETCK,I	NO
0298*				
0299*		ON END-OF-FILE CONDITION RETURN TO P+1 ELSE		
0300*		RETURN TO P+2 WITH NON-BLANK CHARACTER IN (A)		
0301*				
0302	01614	000000	GETCR .NOP	
0303	01615	034133	ISZ CCNT	ANY CHARACTERS LEFT?
0304	01616	002001	RSS	
0305	01617	125614	JMP GETCR,I	NO, END-OF-FILE EXIT
0306	01620	064132	LDB BADDR	LOAD BUFFER ADDRESS
0307	01621	034132	ISZ BADDR	UPDATE FOR NEXT TIME
0308	01622	004065	CLE,ERB	SET CHARACTER FLAG
0309	01623	160001	LDA 1,I	LOAD CURRENT BUFFER WORD
0310	01624	002041	SEZ,RSS	FIRST CHARACTER?
0311	01625	001727	ALF,ALF	YES, POSITION IT
0312	01626	010374	AND B177	MASK EXTRANEOUS BITS
0313	01627	050476	CPA BLANK	BLANK?

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0314	01630	025615	JMP	GETCR+1	YES, FETCH NEXT CHARACTER
0315	01631	035614	ISZ	GETCR	UPDATE RETURN ADDRESS
0316	01632	125614	JMP	GETCR,I	AND EXIT
0317**					
0318*** BACKSPACE OVER ONE CHARACTER **					
0319**					
0320	01633	000000	BCKSP	NOP	
0321	01634	003400	CCA		BACKSPACE
0322	01635	040133	ADA	CCNT	OVER
0323	01636	070133	STA	CCNT	LAST
0324	01637	003400	CCA		CHARACTER IN
0325	01640	040132	ADA	BADDR	INPUT
0326	01641	070132	STA	BADDR	BUFFER
0327	01642	125633	JMP	BCKSP,I	
0328**					
0329*** PRINT A NUMBER **					
0330**					
0331	01643	000000	ENOUT	NOP	
0332	01644	002300	CCE		SET SIGN FLAG TRUE
0333	01645	114220	JSB	NUMOA,I	OUTPUT THE NUMBER
0334	01646	015677	JSB	OUTLN	END-OF-LINE ACTION
0335	01647	060345	LDA	.32	OUTPUT
0336	01650	015715	JSB	OUTCR	A BLANK
0337	01651	064172	LDB	MLBX1+1	FIELD
0338	01652	044133	ADB	CCNT	
0339	01653	006002	SZB		FULL?
0340	01654	025647	JMP	**-5	NO
0341	01655	125643	JMP	ENOUT,I	
0342**					
0343*** SPACE FOR A COMMA **					
0344**					
0345	01656	000000	EDELM	NOP	
0346	01657	064133	LDB	CCNT	NO, LOAD CHARACTER COUNT
0347	01660	006003	EDEL1	SZB,RSS	ZERO?
0348	01661	125656	JMP	EDELM,I	YES
0349	01662	044444	ADB	M15	NO, SUBTRACT ZONE WIDTH
0350	01663	006021	SSB,RSS		NEGATIVE RESULT?
0351	01664	025660	JMP	EDEL1	NO
0352	01665	075677	STB	OUTLN	YES, SAVE BLANK COUNT
0353	01666	060345	LDA	.32	FETCH BLANK
0354	01667	015715	JSB	OUTCR	OUTPUT
0355	01670	035677	ISZ	OUTLN	
0356	01671	025666	JMP	**-3	BLANKS
0357	01672	064133	LDB	CCNT	LINE
0358	01673	044456	ADB	M76	
0359	01674	006021	SSB,RSS		FULL?
0360	01675	015677	JSB	OUTLN	YES
0361	01676	125656	JMP	EDELM,I	

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0363**

0364*** OUTPUT A COMPLETED LINE **

0365**

0366	01677	000000	OUTLN	NOP	
0367	01700	060146	LDA	TYPE	FETCH 'CHARACTERS PRINTED' COUNT
0368	01701	000010	SLA		CORRECT FOR START ON
0369	01702	002004	INA		ODD PRINT POSITION
0370	01703	040133	ADA	CCNT	OUTPUT
0371	01704	064131	LDB	.BUFA	A
0372	01705	114102	JSB	WRITE,I	LINE
0373	01706	064172	LDB	MLBX1+1	CORRECT
0374	01707	044133	ADB	CCNT	
0375	01710	074172	STB	MLBX1+1	MARKER
0376	01711	002400	CLA		RESET COUNT OF
0377	01712	070146	STA	TYPE	CHARACTERS PRINTED
0378	01713	114250	JSB	PRNIA,I	CLEAN UP
0379	01714	125677	JMP	OUTLN,I	

0380**

0381*** ADD A CHARACTER TO OUTPUT BUFFER **

0382**

0383	01715	000000	OUTCR	NOP	CHARACTER IN (A)
0384	01716	071364	STA	IFIX	SAVE CHARACTER
0385	01717	034133	ISZ	CCNT	COUNT IT
0386	01720	064133	LDB	CCNT	FIRST CHARACTER
0387	01721	004010	SLB		OF BUFFER WORD?
0388	01722	034132	ISZ	BADDR	YES, MOVE TO FRESH WORD
0389	01723	160132	LDA	BADDR,I	LOAD BUFFER WORD
0390	01724	004010	SLB		SAVE
0391	01725	001727	ALF,ALF		OTHER
0392	01726	010460	AND	M256	CHARACTER
0393	01727	031364	IOR	IFIX	ADD NEW CHARACTER
0394	01730	004010	SLB		POSITION
0395	01731	001727	ALF,ALF		WORD AND
0396	01732	170132	STA	BADDR,I	STORE IT
0397	01733	125715	JMP	OUTCR,I	

0398*

0399*

0400	00160		TEMP	EQU	TEMPS+1
0401	00161		TEMP1	EQU	TEMPS+2
0402	00162		TEMP2	EQU	TEMPS+3
0403	00163		TEMP3	EQU	TEMPS+4
0404	00164		TEMP4	EQU	TEMPS+5
0405	00165		COUNT	EQU	TEMPS+6
0406	00163		STEMP	EQU	TEMPS+4
0407	01274		MANT1	EQU	SYMCK
0408	01336		MANT2	EQU	MDIM
0409	01603		EXPON	EQU	LETCK
0410	01633		DPFLG	EQU	BCKSP
0411	01715		ARYAD	EQU	OUTCR
0412	00567		EOL	EQU	CONST
0413	01734		FINBP	EQU	*

FIRST UNUSED WORD OF BASE PAGE

BASIC INTERPRETER CONTROL
CHECK SYNTAX AND TRANSLITERATE

PAGE 0040 #02 BASIC INTERPRETER CONTROL

0415*

0416***** BASIC INTERPRETER CONTROL *****

0417*

0418* THIS PROGRAM INTERPRETS THE SYSTEM COMMANDS AND PROVIDES
0419* I/O CONTROL FOR THE BASIC INTERPRETER. ALL USER
0420* COMMUNICATION IS DONE THRU THIS PROGRAM. USER RESPONSES ARE
0421* CHECKED FOR SYSTEM COMMANDS AND IF A VALID COMMAND IS
0422* DETECTED THIS PROGRAM INITIATES APPROPRIATE ACTION.

0423*

0424 02000 ORG 2000B

0425*

0426* DATA LOCAL TO MCNITOR

0427*

0428 02000 002001 RDYA DEF READY
0429 02001 051105 READY ASC 2,READ
0430 02003 054415 OCT 54415
0431 02004 088407 LFEED DEF LF
0432 02005 000465 QMRKA DEF QMARK
0433 02006 003776 STCPA DEF STCMD
0434 02007 002146 CMNDA DEF CMNDS

0435*

0436 02010 107700	ENTRY CLC 0,C	STARTING POINT, TURN OFF ALL I/O
0437 02011 102100	STF 0	TURN ON INTERRUPT SYSTEM
0438 02012 060106	LDA LWBM	LOADED
0439 02013 050111	CPLA LWAM	BY 'BOSS'?
0440 02014 026020	JMP FLUSH	NO
0441 02015 070111	STA LWAM	YES, RESET
0442 02016 002004	INA	POINTER
0443 02017 070117	STA SYMTA	VALUES

0444*

0445 02020 060110	FLUSH LDA FWAM	SET PROGRAM BUFFER ADDRESS
0446 02021 070112	STA PBUFF	SET PROGRAM BUFFER POINTER
0447 02022 070113	STA PBPTR	INITIALIZE
0448 02023 060345	LDA .32	DELETE CHARACTER FOR GETCR
0449 02024 070476	STA BLANK	SET LINE NUMBER
0450 02025 002400	CLA	TO 0 INITIALLY
0451 02026 070145	STA .LNUM	

0452*

0453 02027 060130	RDYPT LDA TLSTR	SET TO
0454 02030 070127	STA LISTR	COMMAND MODE
0455 02031 002400	CLA	
0456 02032 072121	STA DROST	CLEAR DATA REQUEST FLAG
0457 02033 070136	STA TFLAG	CLEAR PHOTO READER INPUT FLAG
0458 02034 070137	STA TTYFL	CLEAR TTY TAPE FLAG
0459 02035 114102	JSB WRITE,I	DO A RETURN AND LINE FEED.
0460 02036 060436	LDA M6	
0461 02037 066000	LDB RDYA	
0462 02040 114102	JSB WRITE,I	PRINT "READY" ON TTY

0463*

0464 02041 060130	PEXMK LDA TLSTR	SHIFT TO
0465 02042 070127	STA LISTR	COMMAND MODE
0466 02043 060136	LDA TFLAG	
0467 02044 002002	SZA	IS TAPE FLAG SET?
0468 02045 026161	JMP PTAPE+1	YES, GET RECORD FROM PHOTO RDR

PAGE 0041 #02 BASIC INTERPRETER CONTROL

0470	02046	066004	DATAI	LDB LFEED	LOAD ADDRESS OF LINE FEED
0471	02047	074152		STB RSYM	STORE ADDRESS OF READY SYMBOL
0472	02050	060137		LDA TTYFL	TTY TAPE
0473	02051	002002		SZA	INPUT?
0474	02052	026056		JMP GTRCD	YES, SUPPRESS LINE FEED
0475	02053	003400		CCA	NO
0476	02054	064152		LDB RSYM	LOAD LF OR '?' ADDRESS
0477	02055	114102		JSB WRITE,I	PRINT LF OR '?', NO CR-LF
0478*					
0479	02056	114123	GTRCD	JSB IMOFF,I	TURN OFF KEYBOARD INTERRUPT MODE
0480	02057	060366		LDA .72	
0481	02060	064131		LDB .BUFA	
0482	02061	114104		JSB REED,I	GET RECORD FROM TTY
0483	02062	050432		CPA M2	
0484	02063	026115		JMP RBOUT	RUBOUT IN RECORD, INPUT AGAIN
0485*					
0486	02064	003021	RPRCS	CMA,SSA,RSS	SET A=-1-# CHARS AND CHECK FOR
0487	02065	014477		JSB ERROR	RECORD TOO LONG
0488	02066	070133	RTLE	STA CCNT	-1-# CHARACTERS < 0, SET CCNT
0489	02067	060131		LDA .BUFA	LOAD BUFFER ADDRESS
0490	02070	000066		CLE,EIA	SHIFT LEFT, LEAST BIT USED AS
0491	02071	070132		STA BADDR	ODD/EVEN FLAG
0492	02072	015614		JSB GETCR	FETCH FIRST CHARACTER
0493	02073	026046		JMP DATAI	NULL RECORD, INPUT AGAIN
0494	02074	066121		LDB DRQST	
0495	02075	006003		SZB,RSS	DATA REQUEST?
0496	02076	026126		JMP CKRCD	NO DATA REQUEST, GO CHECK RECORD
0497	02077	050372		CPA S	ASCII S FIRST CHARACTER?
0498	02100	016200		JSB STOP	ASSUME STOP REQUESTED
0499	02101	002400		CLA	LINE
0500	02102	114102		JSB WRITE,I	FEED
0501	02103	015633		JSB BCKSP	BACKSPACE
0502	02104	060426		LDA RMODE	RETURN TO
0503	02105	070127		STA LISTR	RUN MODE
0504	02106	066121		LDB DRQST	
0505	02107	002400		CLA	
0506	02110	072121		STA DRQST	CLEAR DATA REQUEST FLAG
0507	02111	114124		JSB IMON,I	DATA REQUEST, TURN ON INTRPT MODE
0508	02112	124001		JMP 1,I	GO TO DATA REQUEST CALLING POINT
0509*					
0510	02113	056040		ASC 1,\	
0511	02114	002113		DEF *-1	
0512	02115	066114	RBCUT	LDB *-1	OUTPUT '\' WITH
0513	02116	002404		CLA,INA	CARRIAGE RETURN
0514	02117	114102		JSB WRITE,I	AND LINE FEED
0515	02120	026056		JMP GTRCD	
0516*					
0517*	THIS SECTION REQUESTS DATA INPUT				
0518*					
0519	02121	000000	DRGST	NOP	EXIT/ENTRY AND FLAG
0520	02122	064130		LDB TLSTR	SHIFT TO
0521	02123	074127		STB LISTR	COMMAND MODE
0522	02124	066005		LDB QMRKA	
0523	02125	026047		JMP DATAI+1	PRINT '?' AND WAIT

PAGE 0042 #02 BASIC INTEPRETER CONTROL

0525*
0526* THIS SECTION CHECKS RECORD FOR SYSTEM COMMANDS.
0527*
0528 02126 064134 CKRCD LDB SBUFA
0529 02127 074135 STB SBPTR INITAILIZE SYNTAX BUFFER POINTER
0530 02130 170135 STA SBPTR,I PUT FIRST CHAR IN SYNTAX BUFFER
0531 02131 015603 JSB LETCK IS CHARACTER A LETTER
0532 02132 026220 JMP SYNTX NO, TRY SYNTAX
0533*
0534 02133 060306 LDA TBLAD LOAD SYS CMND TABLE START POINT
0535 02134 064440 LDB M8 LOOK FOR A
0536 02135 114212 JSB TSRCH,I SYSTEM COMMAND
0537 02136 014477 JSB ERROR NOT A VALID COMMAND
0538*
0539 02137 INVSC EQU * INVALID CMND ERROR REFERENCE
0540*
0541 02137 001727 ALF,ALF ENTRY FOUND
0542 02140 001100 AR8 MOVE JMP ADDR TO LEAST BITS POS.
0543 02141 042007 ADA CMNDA ADD START ADDR. OF CMND ROUTINES
0544 02142 072200 STA STOP SAVE (A)
0545 02143 002400 CLA OUTPUT
0546 02144 114102 JSB WRITE,I A CR-LF
0547 02145 126200 JMP STOP,I EXECUTE COMMAND

PAGE 0043 #02 BASIC INTEPRETER CONTROL

0549*			
0550*	THIS SETS UP AND EXECUTES THE SYSTEM COMMANDS		
0551*			COMMAND LIST REFERENCE
0552	02146	CMDRS EQU *	
0553*			
0554	02146 114124	RUN JSB IMON,I	TURN ON TTY INTERRUPT MODE
0555	02147 124202	JMP RUNA,I	GO TO RUN ENTRY POINT
0556*			
0557	02150 026020	SCRTH JMP FLUSH	SCRATCH CURRENT PROGRAM
0558*			
0559	02151 060130	TLIST LDA TL8TR	LIST PROGRAM, TFLAG = 0
0560	02152 006401	CLB,RSS	
0561*			
0562	02153 060126	PLIST LDA PLSTR	PUNCH PROGRAM, TFLAG # 0
0563	02154 070127	STA LISTR	SET DRIVER ADDRESS
0564	02155 074136	STB TFLAG	SET DEVICE FLAG
0565	02156 114124	JSB IMON,I	TURN ON TTY INTERRUPT MODE
0566	02157 124207	JMP LISTA,I	GO TO LIST ENTRY POINT
0567*			
0568	02160 114124	PTAPE JSB IMON,I	PTAPE COMMAND
0569	02161 060366	LDA .72	
0570	02162 064131	LDB .BUFA	
0571	02163 114101	JSB PREAD,I	GET RECORD FROM PHOTO READER
0572	02164 050432	CPA M2	END OF TAPE?
0573	02165 026174	JMP EOTR	YES, GO SEE IF START OR END
0574	02166 050433	CPA M3	PHOTO READER READY?
0575	02167 014477	JSB ERROR	NO
0576	02170 002003	PRERR SZA,RSS	YES
0577	02171 026161	JMP PTAPE+1	NULL RECORD
0578	02172 070136	STA TFLAG	SET FLAG # 0
0579	02173 026064	JMP RPRCS	GO PROCESS RECORD
0580*			
0581	02174 064136	EOTR LDB TFLAG	START OR END OF TAPE?
0582	02175 006003	SZB,RSS	START
0583	02176 026161	JMP PTAPE+1	GO TO READY POINT
0584	02177 026027	JMP RDYPT	
0585*			
0586*	STOP COMMAND SERVICE		
0587*			
0588	02200 000000	STCP NOP	
0589	02201 114123	JSB IMOFF,I	TURN OFF KEYBOARD INTERRUPT MODE
0590	02202 064130	LDB TLSTR	
0591	02203 074127	STB LISTR	SHIFT TO COMMAND MODE
0592	02204 060470	LDA MNEG	
0593	02205 002006	INA,SZA	
0594	02206 026205	JMP *-1	DELAY FOR 100 MILLISECONDS
0595	02207 114102	JSB WRITE,I	CARRIAGE-RETURN LINE-FEED
0596	02210 060327	LDA .4	
0597	02211 066006	LDB STOPA	
0598	02212 114102	JSB WRITE,I	PRINT "STOP"
0599	02213 026027	JMP RDYPT	

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0601*
0602** SET LINE FEED SUPPRESSION
0603*
0604 02214 070137 TAPE STA TTYFL SET TO 'TAPE' MODE
0605 02215 026056 JMP GTRCD
0606*
0607** RETURN TO 'BOSS' EXECUTIVE
0608*
0609 02216 002400 BYEC CLA
0610 02217 024077 JMP 77B

PAGE 0045 #03 CHECK SYNTAX AND TRANSLITERATE

```

0002*
0003* ****
0004*** ***
0005*** CHECK SYNTAX OF STATEMENT ***
0006*** ***
0007* ****
0008*
0009**
0010*** DETERMINE SEQUENCE NUMBER **
0011**
0012 02220 114216 SYNTX JSB INCHK,I RECORD
0013 02221 000463 DEF MAXSN SEQUENCE NUMBER
0014 02222 034135 ISZ SBPTR SAVE SPACE FOR LENGTH WORD
0015 02223 074145 STB .LNUM SAVE LINE NUMBER
0016 02224 064134 LDB SBUFA SET
0017 02225 006004 INB TEMP TO
0018 02226 074160 STB TEMP (SBUFF)+1

0019**
0020*** DETERMINE STATEMENT TYPE **
0021**
0022 02227 050334 CPA .10 NULL STATEMENT?
0023 02230 124253 JMP DELST,I YES, DELETE IT
0024 02231 170135 STA SBPTR,I NO, RECORD NEXT CHARACTER
0025 02232 060307 LDA STTYP PRINT-TABLE ADDRESS
0026 02233 064446 LDB M21 -(NUMBER OF ENTRIES)
0027 02234 114212 JSB TSRCH,I FIND STATEMENT TYPE
0028 02235 014477 JSB ERROR NOT FOUND
0029 02236 064441 SYNE1 LDB M9 SET MULTIPLE STORE
0030 02237 076330 STB M8FLG TO FALSE
0031 02240 064113 LDB PBPTR NULL
0032 02241 054112 CPA PBUFF PROGRAM?
0033 02242 002001 RSS YES
0034 02243 026247 JMP SYNT1 NO
0035 02244 064110 LDB FWAM INSURE NO
0036 02245 074112 STB PBUFF SPURIOUS COMMON
0037 02246 074113 STB PBPTR EXISTS
0038 02247 074157 SYNT1 STB TEMPS SET S-STACK POINTER
0039 02250 006400 CLB SET DEFINE FLAG
0040 02251 076332 STB DFLAG TO FALSE
0041 02252 076334 STB PFLAG SET PARAMETER FLAG TO FALSE
0042 02253 001727 ALF,ALF COMPUTE
0043 02254 001300 RAR ADDRESS OF
0044 02255 040302 ADA STBAS SYNTAX ROUTINE AND
0045 02256 124000 JMP 0,I BRANCH TO IT

0046**
0047*** SINGLE CHARACTER AND/OR FORMULA OPERATORS **
0048**
0049 02257 001000 QUOTE OCT 1000 BITS 15-9 OF THE LABELLED WORD
0050 02260 021040 ASC 1," ARE THE BASIC CODE OPERATOR
0051 02261 002000 COMMA OCT 2000
0052 02262 026040 ASC 1,,
0053 02263 003000 SMCLN OCT 3000 NUMBERS. BITS 3-0 ARE THE
0054 02264 035440 ASC 1,?
0055 02265 004001 RPARN OCT 4001 OPERATOR'S HIERARCHICAL
0056 02266 024440 ASC 1,1 PRECEDENCE FOR THOSE OPERATORS
0057 02267 005001 RBRAC OCT 5001

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PAGE 0046 #03 CHECK SYNTAX AND TRANSLITERATE

0058	02270	056440	ASC 1,1	
0059	02271	006002	SCMMA OCT 6002	BELONGING TO FORMULAS. THE
0060	02272	026040	ASC 1,,	
0061	02273	007002	ASSOP OCT 7002	UNLABELLED WORD GIVES THE
0062	02274	036440	ASC 1,-	
0063	02275	010007	PLS OCT 10007	ASCII REPRESENTATION OF THE
0064	02276	025440	ASC 1,+	
0065	02277	011007	MINUS OCT 11007	SINGLE CHARACTER OPERATORS.
0066	02300	026440	ASC 1,-	
0067	02301	012010	TIMES OCT 12010	
0068	02302	025040	ASC 1,*	
0069	02303	013010	DIV OCT 13010	
0070	02304	027440	ASC 1,/	
0071	02305	014012	EXPS OCT 14012	
0072	02306	057040	ASC 1,^	
0073	02307	015005	GTR OCT 15005	
0074	02310	037040	ASC 1,>	
0075	02311	016005	LSS OCT 16005	
0076	02312	036040	ASC 1,<	
0077	02313	017005	UNEQL OCT 17005	
0078	02314	021440	ASC 1,#	
0079	02315	020005	EQUAL OCT 20005	
0080	02316	036440	ASC 1,-	
0081	02317	021011	UNFIN OCT 21011	
0082	02320	026440	ASC 1,-	
0083	02321	022020	LBRAC OCT 22020	
0084	02322	055440	ASC 1,[
0085	02323	023020	LPARN OCT 23020	
0086	02324	024040	ASC 1,(
0087	02325	024011	UPLUS OCT 24011	
0088	02326	025440	ASC 1,+	
0089	02327	025003	ORCP OCT 25003	
0090	02330	000000	MSFLG NOP	
0091	02331	026004	ANDOP OCT 26004	
0092	02332	000000	DFLAG NOP	
0093	02333	027011	NOTOP OCT 27011	
0094	02334	000000	PFLAG NOP	
0095	02335	030005	GTREQ OCT 30005	
0096	02336	000000	UFLAG NOP	
0097	02337	031005	LSSEQ OCT 31005	
0098*				
0099***			***	
0100**		LET STATEMENT SYNTAX	**	
0101***			***	
0102*				
0103	02340	077530	LETS STB SFLAG	SET 'NO STORE' FLAG ((B) = 0)
0104	02341	060440	LDA M8	SET MULTIPLE STORE FLAG
0105	02342	072330	STA MSFLG	TO TRUE
0106	02343	017114	JSB FSC	FETCH FORMULA
0107	02344	057530	CPB SFLAG	DID STORE OCCUR? ((B)=0)
0108	02345	014477	JSB ERROR	NO
0109	02346		SYNE2 EQU *	
0110**				
0111***		CHECK FOR END OF STATEMENT	**	
0112**				
0113	02346	050334	EOST CPA .10	END-OF-STATEMENT?

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0114 02347 124252 JMP ACCST,I YES, ACCEPT STATEMENT
0115 02350 024266 JMP NOEOF NO, ILLEGAL CHARACTER

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0117*
0118***      ***
0119** DIM STATEMENT SYNTAX **
0120***      ***
0121*
0122 02351 036332  DIMS  ISZ DFLAG    SET DFLAG TO TRUE
0123 02352 017530          JSB ARRYS   CHECK AN ARRAY
0124 02353 124252          JMP ACCST,I  DONE
0125 02354 026352          JMP DIMS+1  WAS A COMMA, CONTINUE
0126*
0127***      ***
0128** COM STATEMENT SYNTAX **
0129***      ***
0130*
0131 02355 064113  COMS  LDB PBPTR   HAS PROGRAM BUFFER
0132 02356 054110          CPA FWAM    BEEN MOVED?
0133 02357 002001          RSS
0134 02360 014477          JSB ERROR   NO
0135 02361 074166  SYNE3 STB TEMPS+7  YES, ILLEGAL COM
0136 02362 036332          ISZ DFLAG   SET ARRAY POINTER
0137 02363 003400  COMS1 CCA
0138 02364 072334          STA PFLAG   SET DEFINE FLAG TO TRUE
0139 02365 017530          JSB ARRYS   SET COMMON FLAG
0140 02366 002001          RSS
0141 02367 026363          JMP COMS1   TO TRUE
0142 02370 064166          LDB TEMPS+7  CHECK AN ARRAY
0143 02371 074112          STB PBUFF   DONE
0144 02372 074113          STB PBPTTR  MORE ARRAYS
0145 02373 124252          JMP ACCST,I  FETCH UPDATED POINTER
                                         SET PROGRAM BUFFER ADDRESS
                                         SET PROGRAM BUFFER POINTER
                                         EXIT
0146*
0147***      ***
0148** DEF STATEMENT SYNTAX **
0149***      ***
0150*
0151 02374 017635  DEFS  JSB LTR     FIRST
0152 02375 026405          JMP SYNE4
0153 02376 060161          LDA TEMP1
0154 02377 001727          ALF,ALF
0155 02400 030162          IOR TEMP2
0156 02401 050464          CPA FN
0157 02402 002001          RSS
0158 02403 026405          JMP SYNE4
0159 02404 017635          JSB LTR
0160 02405 014477  SYNE4 JSB ERROR   TWO CHARACTERS
0161 02406 060161          LDA TEMP1
0162 02407 064361          LDB .58
0163 02410 017650          JSB STROP
0164 02411 060162          LDA TEMP2
0165 02412 017661          JSB LPCK
0166 02413 030470          IOR FLGBT
0167 02414 170135          STA SBPTR,I
0168 02415 017556          JSB VAROP
0169 02416 000000          NOP
0170 02417 014477          JSB ERROR
0171 02420 017671  SYNE5 JSB RPCK
0172 02421 007400          CCB
                                         'FN'?
                                         YES
                                         NO
                                         LETTER FOLLOWS?
                                         NO
                                         YES, RECORD A
                                         FUNCTION
                                         NAME
                                         RETRIEVE CHARACTER
                                         LEFT PARENTHESIS?
                                         YES, SET FORMAL
                                         PARAMETER BIT
                                         FETCH SIMPLE VARIABLE
                                         NONE FOUND
                                         SUBSCRIPTED VARIABLE FOUND
                                         RECORD A RIGHT PARENTHESIS
                                         ASSIGNMENT

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0173	02422	015274	JSB	SYMCK		
0174	02423	002272	DEF	ASSOP-1	OPERATOR?	
0175	02424	014477	SYNE6	JSB	ERROR	
0176	02425	060432	LDA	M2	NO	
0177	02426	040135	ADA	SBPTR	YES,	
0178	02427	160000	LDA	#,I	RETRIEVE	
0179	02430	010401	AND	MSK1	PARAMETER	
0180	02431	072334	STA	PFLAG	AND	
0181	02432	017114	JSB	FSC	SAVE IT	
0182	02433	026346	JMP	EOST	FETCH DEFINING FORMULA	
					END-OF-STATEMENT TEST	
0183*						
0184***						
0185**	REM STATEMENT	SYNTAX				
0186***						
0187*						
0188	02434	060334	REMS	LDA	.10 DUMMY STRING TERMINATOR	
0189	02435	114251		JSB	CHRSA,I	FETCH CHARACTER STRING
0190	02436	124252		JMP	ACCST,I	
0191*						
0192***						
0193**	IF STATEMENT	SYNTAX				
0194***						
0195*						
0196	02437	017114	IFS	JSB	FSC GET DECISION FORMULA	
0197	02440	170135		STA	SBPTR,I TABLE	
0198	02441	060316		LDA	ATHEN SEARCH	
0199	02442	007400		CCB	FOR	
0200	02443	114212		JSB	TSRCH,I 'THEN'	
0201	02444	014477		JSB	ERROR NOT FOUND	
0202	02445		SYNE7	EQU *	GET STATEMENT LABEL NUMBER	
0203*						
0204***					***	
0205**	GO TO AND GOSUB STATEMENT	SYNTAX			**	
0206***					***	
0207	02445	114221	GOTOS	JSB	PGINT,I FETCH AND RECORD	
0208	02446	000463		DEF	MAXSN SEQUENCE NUMBER	
0209	02447	026346		JMP	EOST END-OF-STATEMENT TEST	
0210*						
0211*						
0212***					***	
0213**	FOR STATEMENT	SYNTAX			**	
0214***					***	
0215*						
0216	02450	017556	FORS	JSB	VAROP FETCH SIMPLE VARIABLE	
0217	02451	000000		NOP	NONE FOUND	
0218	02452	014477	SYNE8	JSB	ERROR SUBSCRIPTED VARIABLE FOUND	
0219	02453	007400		CCB		
0220	02454	015274		JSB	SYMCK ASSIGNMENT	
0221	02455	002272		DEF	ASSOP-1 OPERATOR?	
0222	02456	026424		JMP	SYNE6 NO	
0223	02457	017114		JSB	FSC YES, FETCH INITIAL VALUE FORMULA	
0224	02460	170135		STA	SBPTR,I LOOK	
0225	02461	060317		LDA	ATO FOR	
0226	02462	007400		CCB	THE	
0227	02463	114212		JSB	TSRCH,I 'TO'	
0228	02464	014477		JSB	ERROR MISSING	

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0229	02465	017114	SYNE9	JSB FSC	GET LIMIT FORMULA
0230	02466	050334		CPA .10	END-OF-STATEMENT?
0231	02467	124252		JMP ACCST,I	YES
0232	02470	007400		CCB	NO, ERASE
0233	02471	044135		ADB SBPTR	ZERO
0234	02472	074135		STB SBPTR	WORD
0235	02473	170135		STA SBPTR,I	NOW
0236	02474	060320		LDA ASTEP	LOOK
0237	02475	007400		CCB	FOR
0238	02476	114212		JSB T8RCH,I	THE 'STEP'
0239	02477	014477		JSB ERROR	MISSING
0240	02500	017114	SYE10	JSB FSC	GET STEP SIZE FORMULA
0241	02501	026346		JMP EOST	END-OF-STATEMENT TEST
0242*					
0243***				***	
0244**			NEXT STATEMENT SYNTAX	**	
0245***				***	
0246*					
0247	02502	017556	NXTS	JSB VAROP	FETCH SIMPLE VARIABLE
0248	02503	000000		NOP	NONE FOUND
0249	02504	026452		JMP SYNE8	SUBSCRIPTED VARIABLE FOUND
0250	02505	026346		JMP EOST	END-OF-STATEMENT TEST
0251*					
0252***					***
0253**			END, STOP, RESTORE, RETURN STATEMENT SYNTAX	**	
0254***					***
0255*					
0256	02506	034135	ENDS	ISZ SBPTR	
0257	02507	015614		JSB GETCR	END-OF-STATEMENT?
0258	02510	124252		JMP ACCST,I	YES
0259	02511	024266		JMP NOEOF	NO
0260*					
0261***				***	
0262**			WAIT STATEMENT SYNTAX	**	
0263***				***	
0264*					
0265	02512	017734	WAITS	JSB GETPF	
0266	02513	026346		JMP EOST	END-OF-STATEMENT TEST
0267*					
0268***				***	
0269**			CALL STATEMENT SYNTAX	**	
0270***				***	
0271*					
0272	02514	015614	CALLS	JSB GETCR	FETCH AND
0273	02515	024265		JMP EOF	RECORD
0274	02516	034135		ISZ SBPTR	LEFT
0275	02517	017661		JSB LPCK	PARENTHESIS
0276	02520	114221		JSB PPOINT,I	FETCH AND RECORD
0277	02521	000453		DEF D100	SUBROUTINE NUMBER
0278	02522	070161		STA TEMP1	SAVE NEXT CHARACTER
0279	02523	015323		JSB FND8B	FIND
0280	02524	160001		LDA 1,I	NUMBER
0281	02525	001727		ALF,ALF	OF
0282	02526	010344		AND .31	PARAMETERS
0283	02527	003000		CMA	RECORD
0284	02530	070166		STA TEMPS+7	COMPLEMENT - 1

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0285	02531	060161	LDA TEMP1	RETRIEVE CHARACTER
0286	02532	007400	CALL2 CCB	
0287	02533	015274	JSB SYMCK	COMMA?
0288	02534	002260	DEF COMMA-1	
0289	02535	026543	JMP CALL3	
0290	02536	034166	ISZ TEMPS+7	
0291	02537	002001	RSS	NO
0292	02540	014477	SYE11 JSB ERROR	YES, MORE PARAMETERS PERMITTED?
0293	02541	017114	JSB FSC	NO
0294	02542	026532	JMP CALL2	YES, FETCH PARAMETER FORMULA
0295	02543	034166	CALL3 ISZ TEMPS+7	ALL PARAMETERS PRESENT?
0296	02544	026540	JMP SYE11	NO
0297	02545	017671	JSB RPCK	YES, FETCH RIGHT PARENTHESIS
0298	02546	026346	JMP EOST	END-OF-STATEMENT TEST
0299*				
0300***			***	
0301**			DATA STATEMENT SYNTAX **	
0302***			***	
0303*				
0304	02547	014567	DATAS JSB CONST	FETCH A CONSTANT
0305	02550	024613	JMP SYE12-1	NONE FOUND
0306	02551	017744	JSB NUMOP	FIX UP PRECEDING OPERATOR
0307	02552	007400	CCB	CHECK
0308	02553	015274	JSB SYMCK	FOR A
0309	02554	002260	DEF COMMA-1	COMMA
0310	02555	026346	JMP EOST	END-OF-STATEMENT TEST
0311	02556	026547	JMP DATAS	FETCH ANOTHER NUMBER
0312*				
0313***			***	
0314**			READ AND INPUT STATEMENT SYNTAX **	
0315***			***	
0316*				
0317	02557	017556	READS JSB VAROP	RECORD VARIABLE OPERAND
0318	02560	014477	JSB ERROR	MISSING
0319	02561	000000	SYE13 NOP	
0320	02562	007400	CCB	CHECK
0321	02563	015274	JSB SYMCK	FOR A
0322	02564	002260	DEF COMMA-1	COMMA
0323	02565	002001	RSS	
0324	02566	026557	JMP READS	IS, FETCH NEXT ITEM
0325	02567	006400	CLB	APPEND
0326	02570	174135	STB SBPTR,I	END-OF-FORMULA
0327	02571	034135	ISZ SBPTR	OPERATOR
0328	02572	026346	JMP EOST	END OF STATEMENT TEST
0329*				
0330***			***	
0331**			PRINT STATEMENT SYNTAX **	
0332***			***	
0333*				
0334	02573	064432	PRIN1 LDB M2	NO,
0335	02574	015274	JSB SYMCK	COMMA OR
0336	02575	002260	DEF COMMA-1	SEMICOLON?
0337	02576	026604	JMP PRIN2	NO
0338	02577	003400	PRINS CCA	YES, ENABLE
0339	02600	170160	STA TEMP,I	FORMULA
0340	02601	034135	ISZ SBPTR	

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0341	02602	015614	JSB GETCR	END-OF-STATEMENT?
0342	02603	124252	JMP ACCST,I	YES
0343	02604	007400	PRIN2 CCB	
0344	02605	015274	JSB SYMCK	QUOTE?
0345	02606	002256	DEF QUOTE-1	
0346	02607	026623	JMP PRIN3	NO
0347	02610	060347	LDA .34	YES, SET QUOTE AS TERMINATOR
0348	02611	114251	JSB CHRSA,I	CHARACTER AND FETCH STRING
0349	02612	014477	JSB ERROR	MISSING QUOTE
0350	02613	062257	SYE14 LDA QUOTE	RECORD
0351	02614	170135	STA SBPTR,I	QUOTE
0352	02615	034135	ISZ SBPTR	
0353	02616	015614	JSB GETCR	END-OF-STATEMENT?
0354	02617	124252	JMP ACCST,I	YES
0355	02620	007400	CCB	ENABLE
0356	02621	174160	STB TEMP,I	FORMULA
0357	02622	026573	JMP PRIN1	NO
0358	02623	134160	PRIN3 ISZ TEMP,I	TAB OR FORMULA PERMITTED?
0359	02624	014477	JSB ERROR	NO
0360	02625	170135	SYE15 STA SBPTR,I	SEARCH
0361	02626	060322	LDA ATAB	FOR
0362	02627	007400	CCB	'TAB'
0363	02630	114212	JSB TSRCH,I	NOT FOUND
0364	02631	002401	CLA,RSS	
0365	02632	060424	LDA TABCN	BACKUP
0366	02633	007400	CCB	TO WORD WITH
0367	02634	044135	ADB SBPTR	PREVIOUS OPERATOR
0368	02635	074135	STB SBPTR	'TAB' ?
0369	02636	002003	SZA,RSS	NO
0370	02637	026647	JMP PRIN4	
0371	02640	130135	IOR SBPTR,I	YES, RECORD IT
0372	02641	170135	STA SBPTR,I	FETCH PARAMETER
0373	02642	017734	JSB GETPF	FOLLOW
0374	02643	006400	CLB	WITH A
0375	02644	174135	STB SBPTR,I	ZERO
0376	02645	034135	ISZ SBPTR	
0377	02646	026651	JMP PRIN5	BACKSPACE OVER LAST CHARACTER
0378	02647	015633	PRIN4 JSB BCKSP	FETCH FORMULA
0379	02650	017114	JSB F8C	END-OF-STATEMENT?
0380	02651	050334	PRIN5 CPA .10	YES
0381	02652	124252	JMP ACCST,I	NO
0382	02653	026573	JMP PRIN1	
0383*				
0384***			***	
0385**	MAT STATEMENT	SYNTAX	**	
0386***			***	
0387*				
0388	02654	017635	MATS JSB LTR	FIRST
0389	02655	014477	JSB ERROR	TWO CHARACTERS
0390	02656	015603	SYE16 JSB LETCK	LETTER?
0391	02657	026722	JMP MATS2	NO
0392	02660	034135	ISZ SBPTR	YES, MOVE TO FRESH S-BUFFER WORD
0393	02661	064161	LDB TEMP1	RETRIEVE FIRST LETTER AND
0394	02662	005727	BLF,BLF	PUT IT IN THE
0395	02663	030001	IOR 1	UPPER CHARACTER OF (A)
0396	02664	170135	STA SBPTR,I	SEARCH

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0397	02665 060310	LDA MATIO	FOR
0398	02666 064432	LDB M2	'READ' OR
0399	02667 114212	JSB TSRCH,I	'PRINT'
0400	02670 014477	JSB ERROK	NOT FOUND
0401	02671 050416	SYE17 CPA RDOP	READ?
0402	02672 026710	JMP MATS1	YES
0403	02673 017544	MATS0 JSB ARRID	RECORD ARRAY
0404	02674 050334	CPA .10	END-OF-STATEMENT?
0405	02675 124252	JMP ACCST,I	YES
0406	02676 064432	LDB M2	NO,
0407	02677 015274	JSB SYMCK	COMMA OR
0408	02700 002260	DEF COMMA-1	SEMICOLON?
0409	02701 014477	JSB ERROR	NO
0410	02702 015614	SYE18 JSB GETCR	END-OF-STATEMENT?
0411	02703 026706	JMP *+3	YES
0412	02704 015633	JSB BCKSP	NO
0413	02705 026673	JMP MATS0	INCLUDE
0414	02706 034135	ISZ SBPTR	PARAMETER
0415	02707 124252	JMP ACCST,I	RECORD ARRAY
0416	02710 017544	MATS1 JSB ARRID	IF SUBSCRIPT,
0417	02711 017704	JSB MATS0	RECORD IT
0418	02712 000000	NOP	END-OF-STATEMENT?
0419	02713 050334	CPA .10	YES
0420	02714 124252	JMP ACCST,I	NO
0421	02715 007400	CCB	INCLUDE
0422	02716 015274	JSB SYMCK	PARAMETER
0423	02717 002260	DEF COMMA-1	RECORD ARRAY
0424	02718 026701	JMP SYE18-1	IF SUBSCRIPT,
0425	02721 026710	JMP MATS1	RECORD IT
0426	02722 070162	MATS2 STA TEMP2	INCLUDE
0427	02723 060135	LDA SBPTR	PARAMETER
0428	02724 071715	STA ARYAD	RECORD ADDRESS
0429	02725 060161	LDA TEMP1	RETRIEVE FIRST LETTER
0430	02726 064355	LDB .46	RECORD AN
0431	02727 017650	JSB STROP	ARRAY
0432	02730 060162	LDA TEMP2	RETRIEVE CHARACTER
0433	02731 007400	CCB	ASSIGNMENT
0434	02732 015274	JSB SYMCK	OPERATOR?
0435	02733 002272	DEF ASSOP-1	NO
0436	02734 026424	JMP SYNE6	YES, RETRIEVE
0437	02735 161715	LDA ARYAD,I	AND SAVE
0438	02736 010401	AND MSK1	PREVIOUS ARRAY IDENTIFIER
0439	02737 170160	STA TEMP,I	LETTER NEXT?
0440	02740 017635	JSB LTR	NO
0441	02741 027010	JMP MATS4	YES, SECOND LETTER?
0442	02742 015603	JSB LETCK	NO
0443	02743 027024	JMP MATS5	YES,
0444	02744 034135	ISZ SBPTR	CONCATENATE
0445	02745 064161	LDB TEMP1	LETTERS
0446	02746 005727	BLF,BLF	AND
0447	02747 030001	IOR 1	SEARCH
0448	02750 170135	STA SBPTR,I	FOR
0449	02751 060313	LDA MATFN	ARRAY
0450	02752 064435	LDB M5	FUNCTION
0451	02753 114212	JSB TSRCH,I	
0452	02754 014477	JSB ERROR	NOT FOUND

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0453	02755	001727	SYE19	ALF,ALF	FOUND POSITION IT, COMPLETE OPERAND, COMBINE WITH OPERATOR, ADD FLAG BIT, AND STORE
0454	02756	001723		ALF,RAR	
0455	02757	040336		ADA .15	
0456	02760	007400		CCB	
0457	02761	044135		ADB SBPTR	
0458	02762	130001		IOR 1,I	
0459	02763	030470		IOR FLGBT	
0460	02764	170001		STA 1,I	
0461	02765	010401		AND MSK1	'INV' OR
0462	02766	040460		ADA M256	'TRN?
0463	02767	002021		SSA,RSS	YES
0464	02770	026776		JMP MATS3	NO, END-OF-STATEMENT?
0465	02771	015614		JSB GETCR	YES
0466	02772	124252		JMP ACCST,I	NO, SUBSCRIPT?
0467	02773	017704		JSB MATSB	NO
0468	02774	014477		JSB ERROR	
0469	02775	024266	SYE20	JMP NOEOF	GET LEFT PARENTHESIS
0470	02776	015614	MATS3	JSB GETCR	FETCH AND RECORD AN ARRAY
0471	02777	024265		JMP EOF	RECORD A RIGHT PARENTHESIS
0472	03000	017661		JSB LPCK	RETRIEVE
0473	03001	017544		JSB ARRID	PREVIOUS ARRAY IDENTIFIER
0474	03002	017671		JSB RPCK	MATCH LEFT-HAND SIDE ARRAY?
0475	03003	161715		LDA ARYAD,I	YES
0476	03004	010401		AND MSK1	NO
0477	03005	150160		CPA TEMP,I	
0478	03006	014477		JSB ERROK	
0479	03007	124252	SYE21	JMP ACCST,I	
0480	03010	034135	MATS4	ISZ SBPTK	FETCH LEFT PARENTHESIS
0481	03011	017661		JSB LPCK	FETCH FORMULA
0482	03012	017114		JSB FSC	FETCH RIGHT PARENTHESIS
0483	03013	017671		JSB RPCK	MULTIPLICATION
0484	03014	007400		CCB	OPERATOR?
0485	03015	015274		JSB SYMCK	
0486	03016	002300		DEF TIMES-1	
0487	03017	014477		JSB ERROR	NO
0488	03020	017544	SYE22	JSB ARRID	YES, FETCH AND RECORD ARRAY
0489	03021	050334		CPA .10	END-OF-STATEMENT?
0490	03022	124252		JMP ACCST,I	YES
0491	03023	024266		JSB NOEOF	NO
0492	03024	070162	MATS5	STA TEMP2	SAVE
0493	03025	060135		LDA SBPTR	OPERAND ADDRESS
0494	03026	071715		STA ARYAD	RETRIEVE
0495	03027	060161		LDA TEMP1	AND RECORD
0496	03030	064355		LDB .46	ARRAY
0497	03031	017650		JSB STROP	END-OF-
0498	03032	060162		LDA TEMP2	STATEMENT?
0499	03033	050334		CPA .10	YES
0500	03034	124252		JMP ACCST,I	NO, MUST BE
0501	03035	064433		LDB M3	A '+',
0502	03036	015274		JSB SYMCK	'-', OR '*'
0503	03037	002274		DEF PLUS-1	ISN'T
0504	03040	014477		JSB ERROR	IS, SET FOR FALSE
0505	03041	006400	SYE23	CLB	
0506	03042	040332		ADA .8	'*'?
0507	03043	052301		CPA TIMES	YES
0508	03044	027061		JMP MATS7	

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0509	03045	076334	MATS6	STB PFLAG	NO, SET PFLAG
0510	03046	017544		JSB ARRID	GET SECOND ARRAY
0511	03047	050334		CPL .10	END-OF-STATEMENT?
0512	03050	002001		RSS	YES
0513	03051	024266		JMP NOEOF	NO
0514	03052	036334		ISZ PFLAG	WAS OPERATOR A '*'?
0515	03053	124252		JMP ACCST,I	NO
0516	03054	161715		LDA ARYAD,I	YES, RETRIEVE
0517	03055	010401		AND MSK1	SECOND ARRAY
0518	03056	150160		CPL TEMP,I	MATCH LEFT-HAND SIDE ARRAY?
0519	03057	014477	SYE24	JSB ERROR	YES
0520	03060	124252		JMP ACCST,I	NO
0521	03061	161715	MATS7	LDA ARYAD,I	RETRIEVE
0522	03062	010401		AND MSK1	ARRAY
0523	03063	007400		CCB	SET FOR TRUE
0524	03064	150160		CPL TEMP,I	MATCH LEFT-HAND SIDE ARRAY?
0525	03065	027057		JMP SYE24	YES
0526	03066	027045		JMP MATS6	NO

0527**

0528*** JUMP TABLE FOR STATEMENT SYNTAX **

0529**

0530	03067	002340	SYNTB	DEF LETS	LET
0531	03070	002351		DEF DIMS	DIM
0532	03071	002355		DEF COMS	COM
0533	03072	002374		DEF DEFS	DEF
0534	03073	002434		DEF REMS	REM
0535	03074	002445		DEF GOTOS	GO TO
0536	03075	002437		DEF IFS	IF
0537	03076	002450		DEF FORS	FOR
0538	03077	002502		DEF NXTS	NEXT
0539	03100	002445		DEF GOTOS	GOSUB
0540	03101	002506		DEF ENDS	RETURN
0541	03102	002506		DEF ENDS	END
0542	03103	002506		DEF ENDS	STOP
0543	03104	002512		DEF WAITS	WAIT
0544	03105	002514		DEF CALLS	CALL
0545	03106	002547		DEF DATAS	DATA
0546	03107	002557		DEF READS	READ
0547	03110	002577		DEF PRINS	PRINT
0548	03111	002557		DEF READS	INPUT
0549	03112	002506		DEF ENDS	RESTORE
0550	03113	002654		DEF MATS	MAT

0551*

0552*** ***

0553** FORMULA SYNTAX CHECKER **

0554*** ***

0555*

0556	03114	000000	FSC	NOP	
0557	03115	002400		CLA	SET LEFT PARENTHESIS
0558	03116	170157		STA TEMPS,I	COUNT TO ZERO
0559	03117	003400	FSC1	CCA	SET UNARY FLAG
0560	03120	072336		STA UFLAG	TO TRUE
0561	03121	017556	FSC2	JSB VAROP	LOOK FOR VARIABLE OPERAND
0562	03122	027261		JMP FSC9	NOT FOUND
0563	03123	027227		JMP FSC6	SUBSCRIPTED VARIABLE FOUND
0564	03124	015603		JSB LETCK	FOLLOWED BY LETTER?

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0565	03125	027227	JMP FSC6	NO	
0566	03126	064432	LDB M2	YES, LOOK FOR 'AND' OR 'OR'	
0567	03127	017322	JSB MCBCK	NOT FOUND, FETCH PREVIOUS	
0568	03130	060161	LDA TEMP1	CHARACTER AND LEFT-JUSTIFY IT	
0569	03131	001727	ALF,ALF		
0570	03132	030162	IOR TEMP2	ADD LATEST CHARACTER	
0571	03133	050464	CPA FN	'FN'?	
0572	03134	027162	JMP FSC4	YES	
0573	03135	170135	STA SBPTR,I	NO,	
0574	03136	060312	LDA PDFNS	SEARCH FOR	
0575	03137	064443	LDB M11	PREDEFINED	
0576	03140	114212	JSB TSRCH,I	FUNCTION	
0577	03141	027146	JMP FSC3	NOT FOUND	
0578	03142	001727	ALF,ALF	ASSEMBLE	
0579	03143	001723	ALF,RAR	OPERAND	
0580	03144	030470	IOR FLGBT	ADD FLAG BIT	
0581	03145	027170	JMP FSC5		
0582	03146	036336	FSC3	ISZ UFLAG	'NOT' PERMITTED?
0583	03147	027252	JMP FSC8-1	NO	
0584	03150	060321	LDA ANOT	YES,	
0585	03151	007400	CCB	SEARCH FOR	
0586	03152	114212	JSB TSRCH,I	'NOT'	
0587	03153	027252	JMP FSC8-1	'NOT' NOT FOUND	
0588	03154	007400	CCB	RETRIEVE	
0589	03155	044135	ADB SBPTR	PREVIOUS WORD	
0590	03156	160001	LDA 1,I	WORD	
0591	03157	010420	AND OPMASK	SET TO	
0592	03160	170001	STA 1,I	NULL OPERAND	
0593	03161	027317	JMP FSC14		
0594	03162	015614	FSC4	JSB GETCR	IDENTIFYING
0595	03163	026405	JMP SYNE4	FUNCTION	
0596	03164	015603	JSB LETCK	LETTER?	
0597	03165	026405	JMP SYNE4	NO	
0598	03166	040453	ADA D100	YES,	
0599	03167	001700	ALF	ASSEMBLE AND	
0600	03170	040336	FSC5	ADA .15	SAVE
0601	03171	070161	STA TEMP1	FUNCTION IDENTIFIER	
0602	03172	007400	CCB	RETRIEVE	
0603	03173	044135	ADB SBPTR	PREVIOUS	
0604	03174	160001	LDA 1,I	PROGRAM WORD	
0605	03175	010420	AND OPMASK	EXTRACT OPERATOR,	
0606	03176	030161	IOR TEMP1	APPEND OPERAND,	
0607	03177	170001	STA 1,I	AND RECORD	
0608	03200	015614	JSB GETCR	LEFT PARENTHESIS	
0609	03201	014477	FSCE1	OR	
0610	03202	017661	JSB LPCK	LEFT BRACKET?	
0611	03203	017353	JSB FRCUR	YES, SAVE LOCAL VARIABLES OF FSC	
0612	03204	017114	JSB FSC	FETCH ACTUAL PARAMETER	
0613	03205	017330	JSB FPOP	RESTORE LOCAL VARIABLES OF FSC	
0614	03206	017671	JSB RPCK	FETCH RIGHT PARENTHESIS	
0615	03207	027272	JMP FSC10+1		
0616	03210	064432	FSC7	LDB M2	CHECK FOR
0617	03211	015274	JSB SYMCK	RIGHT PARENTHESIS	
0618	03212	002264	DEF RPARN-1	OR RIGHT BRACKET	
0619	03213	027253	JMP FSC8	NOT FOUND	
0620	03214	060406	LDA B4000	RECORD A	

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0621	03215	170135	STA SBPTR,I	RIGHT PARENTHESIS
0622	03216	060352	LDA .41	RESTORE RIGHT PARENTHESIS
0623	03217	007400	CCB	MATCHING
0624	03220	144157	ADB TEMPS,I	LEFT
0625	03221	006020	SSB	PARENTHESIS?
0626	03222	027253	JMP FSC8	NO
0627	03223	174157	STB TEMPS,I	YES
0628	03224	034135	ISZ SBPTR	
0629	03225	015614	JSB GETCR	FETCH
0630	03226	060334	LDA .10	CHARACTER
0631	03227	050334	FSC6 CPA .10	END OF FORMULA?
0632	03230	027253	JMP FSC8	YES
0633	03231	072336	STA UFLAG	NO, SET UNARY FLAG TO FALSE
0634	03232	064435	LDB M5	SEARCH FOR A MULTICHA RACTER
0635	03233	017322	JSB MCBCK	BINARY OPERATOR
0636	03234	160135	LDA SBPTR,I	NOT FOUND,
0637	03235	001727	ALF,ALF	RESTORE
0638	03236	010374	AND B177	CHARACTER
0639	03237	066330	LDB MSFLG	SEARCH
0640	03240	015274	JSB SYMCK	FOR A
0641	03241	002274	DEF PLUS-1	BINARY OPERATOR
0642	03242	002001	RSS	NOT FOUND
0643	03243	027301	JMP FSC12	FOUND
0644	03244	007400	CCB	ASSIGNMENT
0645	03245	015274	JSB SYMCK	
0646	03246	002272	DEF ASSOP-1	OPERATOR?
0647	03247	027210	JMP FSC7	NO
0648	03250	073530	STA SFLAG	YES, SET
0649	03251	027117	JMP FSC1	'STORE OCCURRED' FLAG
0650	03252	060162	LDA TEMP2	RETRIEVE LETTER
0651	03253	164157	FSC8 LDB TEMPS,I	ALL LEFT PARENTHESES
0652	03254	006002	SZB	MATCHED?
0653	03255	014477	FSC8 JSB ERROR	NO
0654	03256	174135	STB SBPTR,I	YES, RECORD AN
0655	03257	034135	ISZ SBPTR	END-OF-FORMULA AND
0656	03260	127114	JMP FSC,I	EXIT WITH CHARACTER IN (A)
0657*				
0658	03261	050351	FSC9 CPA .40	LEFT
0659	03262	027275	JMP FSC11	PARENTHESIS
0660	03263	050373	CPA B133	OR LEFT BRACKET?
0661	03264	027275	JMP FSC11	YES
0662	03265	006400	CLB	NO, SET SIGN
0663	03266	074153	STB SIGN	POSITIVE
0664	03267	014615	JSB NUMCK	NUMBER?
0665	03270	027384	JMP FSC13	NO
0666	03271	017744	FSC10 JSB NUMOP	YES, FIX UP PRECEDING OPERATOR
0667	03272	064441	LDB M9	UPDATE
0668	03273	076330	STB MSFLG	MULTIPLE STORE
0669	03274	027227	JMP FSC6	FLAG
0670	03275	034135	FSC11 ISZ SBPTR	YES
0671	03276	060413	LDA B2300	RECORD
0672	03277	170135	STA SBPTR,I	IT AND
0673	03300	134157	ISZ TEMPS,I	COUNT IT
0674	03301	064441	FSC12 LDB M9	UPDATE
0675	03302	076330	STB MSFLG	MULTIPLE STORE FLAG
0676	03303	027117	JMP FSC1	FLAG

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0677	03304	036336	FSC13	ISZ	UFLAG	UNARY OPERATORS PERMITTED?
0678	03305	014477	FSCE3	JSB	ERROR	NO
0679	03306	064411		LDB	UNMNC	
0680	03307	050353		CPA	.43	'+'?
0681	03310	027314		JMP	*+4	YES
0682	03311	050354		CPA	.45	NO, '-'?
0683	03312	027315		JMP	*+3	YES
0684	03313	027305		JMP	FSCE3	NO
0685	03314	044404		ADB	B3000	STORE
0686	03315	034135		ISZ	SBPTR	UNARY
0687	03316	174135		STB	SBPTR,I	OPERATOR
0688	03317	064441	FSC14	LDB	M9	UPDATE
0689	03320	076330		STB	MSFLG	MULTIPLE STORE FLAG
0690	03321	027121		JMP	FSC2	FLAG

0691**

0692*** CHECK FOR A MULTICHARACTER BINARY OPERATOR **

0693**

0694	03322	000000	MCBCK	NOP		
0695	03323	170135		STA	SBPTR,I	SEARCH
0696	03324	060311		LDA	MCBOP	FOR 'AND'
0697	03325	114212		JSB	T8RCH,I	OR 'OR'
0698	03326	127322		JMP	MCBCK,I	NOT FOUND
0699	03327	027301		JMP	FSC12	FOUND

0001**

0002*** RESTORE FSC LOCAL QUANTITIES **

0003**

0004	03330	000000	FPOP	NOP		
0005	03331	070161		STA	TEMP1	SAVE CHARACTER
0006	03332	064157		LDB	TEMPS	
0007	03333	044435		ADB	M5	
0008	03334	074157		STB	TEMPS	RESTORE S-STACK TOP
0009	03335	006004		INB		
0010	03336	160001		LDA	1,I	
0011	03337	072330		STA	MSFLG	RESTORE MULTIPLE STORE FLAG
0012	03340	006004		INB		
0013	03341	160001		LDA	1,I	
0014	03342	072336		STA	UFLAG	RESTORE UNARY OPERATOR FLAG
0015	03343	006004		INB		
0016	03344	160001		LDA	1,I	
0017	03345	073114		STA	FSC	RESTORE FSC RETURN ADDRESS
0018	03346	006004		INB		
0019	03347	160001		LDA	1,I	RESTORE
0020	03350	073556		STA	VAROP	VAROP RETURN ADDRESS
0021	03351	060161		LDA	TEMP1	RETRIEVE CHARACTER
0022	03352	127330		JMP	FPOP,I	

0023**

0024*** SAVE LOCAL QUANTITIES OF FSC **

0025**

0026	03353	000000	FRCUR	NOP		
0027	03354	064157		LDB	TEMPS	FETCH CURRENT S-STACK POINTER
0028	03355	006004		INB		UPDATE IT
0029	03356	062330		LDA	MSFLG	DUMP MULTIPLE STORE
0030	03357	170001		STA	1,I	FLAG ON S-STACK
0031	03360	006004		INB		
0032	03361	062336		LDA	UFLAG	STACK UNARY OPERATOR
0033	03362	170001		STA	1,I	FLAG

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0034	03363	006004	INB	
0035	03364	063114	LDA FSC	STACK FSC
0036	03365	170001	STA 1,I	RETURN ADDRESS
0037	03366	063556	LDA VAROP	STACK VAROP RETURN ADDRESS
0038	03367	017371	JSB SSOV	AND CHECK FOR S-STACK OVERFLOW
0039	03370	127353	JMP FRCUR,I	
0040**				
0041*** PUT ITEM ON S-STACK AND CHECK FOR OVERFLOW **				
0042**				
0043	03371	000000	SSCV NOP	STORE QUANTITY
0044	03372	006004	INB	ADVANCE S-STACK POINTER
0045	03373	170001	STA 1,I	SAVE ITEM IN (A)
0046	03374	006004	INB	ADVANCE S-STACK POINTER
0047	03375	074157	STB TEMPS	AND RECORD IT
0048	03376	007004	CMB,INB	
0049	03377	044106	ADD LWBM	LAST WORD
0050	03400	006020	SSB	EXCEEDED?
0051	03401	014477	FSCE4 JSB ERROR	YES
0052	03402	127371	JMP SSOV,I	
0053**				
0054*** CHECK FOR SUBSCRIPT PART **				
0055**				
0056	03403	000000	SBSCK NOP	CHARACTER IN (A)
0057	03404	064432	LDB M2	LEFT BRACKET
0058	03405	015274	JSB SYMCK	OR
0059	03406	002320	DEF LBRAC-1	LEFT PARENTHESIS?
0060	03407	127403	JMP SBSCK,I	NO, RETURN VIA (P+1)
0061	03410	037403	ISZ SBSCK	YES, SET RETURN TO (P+2)
0062	03411	161715	LDA ARYAD,I	SET
0063	03412	010445	AND M16	ARRAY
0064	03413	002004	INA	TO
0065	03414	171715	STA ARYAD,I	SINGLE SUBSCRIPT
0066	03415	060412	LDA B2200	RECORD A
0067	03416	170135	STA SBPTR,I	LEFT BRACKET
0068	03417	006400	CLB	DIM OR COM
0069	03420	056332	CPB DFLAG	STATEMENT?
0070	03421	027473	JMP SBSC3	NO
0071	03422	114221	JSB PGINT,I	FETCH INTEGER
0072	03423	000460	DEF M256	SUBSCRIPT BOUND
0073	03424	005727	BLF,BLF	SAVE
0074	03425	074161	STB TEMP1	BOUND
0075	03426	007400	CCB	IS THE
0076	03427	015274	JSB SYMCK	NEXT CHARACTER
0077	03430	002270	DEF SCMMA-1	A COMMA?
0078	03431	027436	JMP SBSC1	NO
0079	03432	135715	ISZ ARYAD,I	YES, NOTE SECOND SUBSCRIPT
0080	03433	114221	JSB PGINT,I	FETCH SECOND
0081	03434	000460	DEF M256	INTEGER SUBSCRIPT BOUND
0082	03435	002001	RSS	
0083	03436	006404	SBSCL CLB,INB	SET ONE-DIMENSIONAL CASE
0084	03437	036334	ISZ PFLAG	COM STATEMENT?
0085	03440	027450	JMP SBSC2	NO
0086	03441	070162	STA TEMP2	SAVE CHARACTER
0087	03442	060001	LDA 1	
0088	03443	030161	IOR TEMP1	RETRIEVE FIRST BOUND
0089	03444	015336	JSB MDIM	FIND STORAGE NEED

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0090	03445	040166	ADA TEMPS+7	UPDATE COM
0091	03446	070166	STA TEMP8+7	STORAGE POINTER
0092	03447	060162	LDA TEMP2	RETRIEVE NEXT CHARACTER
0093	03450	064432	LDB M2	RIGHT PARENTHESIS
0094	03451	015274	JSB SYMCK	OR
0095	03452	002264	DEF RPARN-1	RIGHT BRACKET?
0096	03453	027255	JMP FSCE2	NO
0097	03454	060407	LDA LF	YES, RECORD A
0098	03455	170135	STA SBPTR,I	RIGHT BRACKET
0099	03456	034135	ISZ SBPTR	ADJUST S-BUFFER POINTER
0100	03457	015614	JSB GETCR	FETCH FOLLOWING
0101	03460	060334	LDA .10	CHARACTER
0102	03461	066332	LDB DFLAG	DIM OR COM
0103	03462	006002	SZB	STATEMENT?
0104	03463	127403	JMP SBSCK,I	YES
0105	03464	017330	JSB FPOP	RESTORE FSC LOCAL VARIABLES
0106	03465	064432	LDB M2	RESTORE
0107	03466	044157	ADB TEMPS	S-STACK
0108	03467	074157	STB TEMPS	POINTER
0109	03470	006004	INB	FETCH
0110	03471	164001	LDB 1,I	RETURN ADDRESS
0111	03472	124001	JMP 1,I	AND EXIT
0112	03473	063403	SBSC3 LDA SBSCK	SAVE
0113	03474	064157	LDB TEMPS	RETURN ADDRESS
0114	03475	017371	JSB SSOV	ON S-STACK
0115	03476	017353	JSB FRCUR	SAVE FSC LOCAL VARIABLES
0116	03477	064441	LDB M9	SET MULTIPLE STORE FLAG
0117	03500	076330	STB MSFLG	TO FALSE
0118	03501	061715	LDA ARYAD	SAVE
0119	03502	064157	LDB TEMPS	OPERAND
0120	03503	017371	JSB SSOV	ADDRESS
0121	03504	017114	JSB FSC	GET SUBSCRIPT FORMULA
0122	03505	007400	CCB	CANCEL
0123	03506	044135	ADB SBPTR	END-OF-FORMULA
0124	03507	074135	STB SBPTR	OPERATOR
0125	03510	064432	LDB M2	RESTORE
0126	03511	044157	ADB TEMPS	S-STACK
0127	03512	074157	STB TEMPS	POINTER
0128	03513	006004	INB	RESTORE
0129	03514	164001	LDB 1,I	OPERAND
0130	03515	075715	STB ARYAD	ADDRESS
0131	03516	007400	CCB	IS THE
0132	03517	015274	JSB SYMCK	NEXT CHARACTER
0133	03520	002270	DEF SCMMA-1	A COMMA?
0134	03521	027450	JMP SBSC2	NO
0135	03522	135715	ISZ ARYAD,I	YES, NOTE SECOND SUBSCRIPT
0136	03523	017114	JSB FSC	GET SUBSCRIPT FORMULA
0137	03524	007400	CCB	CANCEL
0138	03525	044135	ADB SBPTR	END-OF-FORMULA
0139	03526	074135	STB SBPTR	OPERATOR
0140	03527	027450	JMP SBSC2	

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0142**

0143*** CHECK SYNTAX OF ARRAY DEFINITIONS **

0144**

0145	03530	000000	ARRY5 NOP	
0146	03531	017544	JSB ARRID	FETCH ARRAY IDENTIFIER
0147	03532	017403	JSB SBSCK	RECORD A SUBSCRIPT
0148	03533	014477	JSB ERROR	MISSING SUBSCRIPT
0149	03534	050334	ARRE1 CPA .10	END-OF-STATEMENT?
0150	03535	127530	JMP ARRYS,I	YES, RETURN VIA (P+1)
0151	03536	007400	CCB	NO,
0152	03537	015274	JSB SYMCK	MUST BE
0153	03540	002260	DEF COMMA-1	A COMMA
0154	03541	024266	JMP NOEOF	ISN'T
0155	03542	037530	ISZ ARRYS	IS, RETURN
0156	03543	127530	JMP ARRYS,I	VIA (P+2)

0157**

0158*** FETCH ARRAY IDENTIFIER **

0159**

0160	03544	000000	ARRID NOP	
0161	03545	017635	JSB LTR	FETCH LETTER
0162	03546	014477	JSB ERROR	NONE FOUND
0163	03547	060135	ARRE2 LDA SBPTR	SAVE
0164	03550	071715	STA ARYAD	OPERAND ADDRES
0165	03551	060161	LDA TEMP1	RECORD
0166	03552	064355	LDB .46	ARRAY
0167	03553	017650	JSB STROP	IDENTIFIER
0168	03554	060162	LDA TEMP2	RETRIEVE FOLLOWING CHARACTER
0169	03555	127544	JMP ARRID,I	

0170**

0171*** CHECK FOR VARIABLE OPERAND **

0172**

0173	03556	000000	VAROP NOP	
0174	03557	017635	JSB LTR	LETTER?
0175	03560	127556	JMP VAROP,I	NO, EXIT VIA (P+1)
0176	03561	037556	ISZ VAROP	
0177	03562	050351	CPA .40	LEFT PARENTHESIS?
0178	03563	027624	JMP VAR05	YES
0179	03564	050373	CPA B133	NO, LEFT BRACKET?
0180	03565	027624	JMP VAR05	YES
0181	03566	037556	ISZ VAROP	NO
0182	03567	015570	JSB DIGCK	DIGIT?
0183	03570	027600	JMP VAR01	NO
0184	03571	060161	LDA TEMP1	YES, RETRIEVE LETTER,
0185	03572	044357	ADB .48	AND RESTORE ASCII DIGIT
0186	03573	074161	STB TEMP1	
0187	03574	017650	JSB STROP	RECORD VARIABLE
0188	03575	015614	JSB GETCR	FETCH FOLLOWING
0189	03576	060334	LDA .10	CHARACTER
0190	03577	027604	JMP VAR02	
0191	03600	060161	VAR01 LDA TEMP1	RETRIEVE LETTER,
0192	03601	064356	LDB .47	SET 'NO DIGIT',
0193	03602	017650	JSB STROP	AND RECORD VARIABLE
0194	03603	060162	LDA TEMP2	RETRIEVE FOLLOWING CHARACTER
0195	03604	070162	VAR02 STA TEMP2	SAVE CHARACTER
0196	03605	006400	CLB	INSIDE A
0197	03606	056334	CPB PFLAG	DEF STATEMENT?

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0198	03607	127556	JMP VAROP,I	NO, EXIT VIA (P+3)
0199	03610	007400	CCB	
0200	03611	044135	ADB SBPTR	RETRIEVE
0201	03612	160001	LDA 1,I	
0202	03613	010401	AND MSK1	OPERAND
0203	03614	052334	CPA PFLAG	MATCH PARAMETER?
0204	03615	027620	JMP VAR04	YES
0205	03616	060162	VAR03 LDA TEMP2	NO, RETRIEVE
0206	03617	127556	JMP VAROP,I	CHARACTER AND EXIT VIA (P+3)
0207	03620	160001	VAR04 LDA 1,I	SET OPERAND TO
0208	03621	030470	IOR FLGBT	ACTUAL PARAMETER
0209	03622	170001	STA 1,I	AND RECORD IT
0210	03623	027616	JMP VAR03	
0211	03624	060135	VAR05 LDA SBPTR	SAVE
0212	03625	071715	STA ARYAU	OPERAND ADDRESS
0213	03626	060161	LDA TEMP1	RETRIEVE LETTER
0214	03627	064355	LDB .46	RECORD
0215	03630	017650	JSB STROP	ARRAY IDENTIFIER
0216	03631	060373	LDA B133	RETRIEVE LEFT BRACKET
0217	03632	017403	JSB SBSCK	FETCH SUBSCRIPT
0218	03633	000000	NOP	
0219	03634	127556	JMP VAROP,I	EXIT VIA (P+2)
0220**				
0221***		FETCH A LETTER	**	
0222**				
0223	03635	000000	LTR NOP	
0224	03636	015614	JSB GETCR	
0225	03637	060334	LDA .10	
0226	03640	015603	JSB LETCK	LETTER?
0227	03641	127635	JMP LTR,I	NO, EXIT VIA (P+1)
0228	03642	037635	ISZ LTR	YES,
0229	03643	070161	STA TEMP1	SAVE IT
0230	03644	015614	JSB GETCR	NEXT CHARACTER
0231	03645	060334	LDA .10	TO (A)
0232	03646	070162	STA TEMP2	SAVE SECOND CHARACTER
0233	03647	127635	JMP LTR,I	EXIT VIA (P+2)
0234**				
0235***		STORE AN OPERAND NAME	**	
0236**				
0237	03650	000000	STROP NOP	LETTER IN (A), NUMBER IN (B)
0238	03651	040453	ADA D100	NUMERICALLY ADJUST THE
0239	03652	044451	ADB D53	OPERAND NAME
0240	03653	001700	ALF	COMBINE THE
0241	03654	030001	IOR 1	TWO PARTS
0242	03655	130135	IOR SBPTR,I	COMPLETE OPERAND-OPERATOR PAIR
0243	03656	170135	STA SBPTR,I	AND STORE IT
0244	03657	034135	ISZ SBPTR	UPDATE S-BUFFER POINTER
0245	03660	127650	JMP STROP,I	

0247**

0248*** CHECK FOR LEFT PARENTHESIS **

0249**

0250	03661	000000	LPCK	NOP	CHARACTER IN (A)
0251	03662	064432		LDB M2	LEFT PARENTHESIS
0252	03663	015274		JSB SYMCK	OR
0253	03664	002320		DEF LBRAC-1	LEFT BRACKET?
0254	03665	027201		JMP FSCE1	NO
0255	03666	060413		LDA B2300	YES, RECORD A
0256	03667	170135		STA SBPTR,I	LEFT PARENTHESIS
0257	03670	127661		JMP LPCK,I	EXIT

0258**

0259*** CHECK FOR RIGHT PARENTHESIS **

0260**

0261	03671	000000	RPCK	NOP	
0262	03672	064432		LDB M2	RIGHT PARENTHESIS
0263	03673	015274		JSB SYMCK	OR
0264	03674	002264		DEF RPARN-1	RIGHT BRACKET?
0265	03675	027255		JMP FSCE2	NO
0266	03676	060406		LDA B4000	YES, RECORD A
0267	03677	170135		STA SBPTR,I	RIGHT PARENTHESIS
0268	03700	034135		ISZ SBPTR	UPDATE SYNTAX BUFFER POINTER
0269	03701	015614		JSB GETCR	FETCH
0270	03702	060334		LDA .10	FOLLOWING CHARACTER
0271	03703	127671		JMP RPCK,I	

0272**

0273*** FETCH MAT STATEMENT SUBSCRIPT **

0274**

0275	03704	000000	MATSB	NOP	
0276	03705	064432		LDB M2	LEFT PARENTHESIS
0277	03706	015274		JSB SYMCK	OR
0278	03707	002320		DEF LBRAC-1	LEFT BRACKET?
0279	03710	127704		JMP MATSB,I	NO
0280	03711	037704		ISZ MATSB	YES, SET RETURN ADDRESS
0281	03712	060412		LDA B2200	RECORD A
0282	03713	170135		STA SBPTR,I	LEFT BRACKET
0283	03714	017114		JSB FSC	FETCH SUBSCRIPT
0284	03715	007400		CCB	
0285	03716	015274		JSB SYMCK	COMMA?
0286	03717	002260		DEF COMMA-1	
0287	03720	002001		RSS	NO
0288	03721	017114		JSB FSC	YES, FETCH SUBSCRIPT
0289	03722	064432		LDB M2	RIGHT PARENTHESIS
0290	03723	015274		JSB SYMCK	OR
0291	03724	002264		DEF RPARN-1	RIGHT BRACKET
0292	03725	027255		JMP FSCE2	
0293	03726	060407		LDA LF	RECORD A
0294	03727	170135		STA SBPTR,I	RIGHT BRACKET
0295	03730	034135		ISZ SBPTR	
0296	03731	015614		JSB GETCR	END-OF-STATEMENT?
0297	03732	124252		JMP ACCST,I	YES
0298	03733	127704		JMP MATSB,I	

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0300**
0301*** FETCH PARENTHESIZED FORMULA **
0302**
0303 03734 000000 GETPF NOP
0304 03735 015614 JSB GETCR
0305 03736 024265 JMP EOF
0306 03737 034135 ISZ SBPTR
0307 03740 01/661 JSB LPCK FETCH LEFT PARENTHESIS
0308 03741 017114 JSB FSC FETCH FORMULA
0309 03742 017671 JSB RPCK GET RIGHT PARENTHESIS
0310 03743 127734 JMP GETPF,I
0311**
0312*** FLAG OPERATOR WHICH PRECEDES NUMBER **
0313**
0314 03744 000000 NUMOP NOP
0315 03745 070164 STA TEMP4
0316 03746 064433 LDB M3 FETCH
0317 03747 044135 ADB SBPTR PRECEDING
0318 03750 160001 LDA 1,I OPERATOR
0319 03751 030470 IOR FLGBT ADD FLAG BIT
0320 03752 170001 STA 1,I REPLACE OPERATOR
0321 03753 060164 LDA TEMP4
0322 03754 127744 JMP NUMOP,I

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0324*

0325* SYSTEM COMMAND TABLE

0326*

0327 03755 000003 SYCMD OCT 00003

0328 03756 051125 ASC 2,RUN EXECUTE PROGRAM

0329*

0330 03760 002003 OCT 02003

0331 03761 051503 ASC 2,SCR SCRATCH PROGRAM

0332*

0333 03763 003004 OCT 03004

0334 03764 046111 ASC 2,LIST LIST COMMAND

0335*

0336 03766 005005 OCT 05005

0337 03767 050114 ASC 3,PLIST PUNCH LIST COMMAND

0338*

0339 03772 012003 OCT 12003

0340 03773 050124 ASC 2,PTA ACTIVATE PHOTO-READER

0341*

0342 03775 033004 OCT 33004

0343 03776 051524 STCMD ASC 2,STOP ABORT CURRENT ACTIVITY

0344*

0345 04000 046003 OCT 46003

0346 04001 052101 ASC 2,TAP ACTIVATE TTY TAPE MODE

0347*

0348 04003 050003 OCT 50003

0349 04004 041131 ASC 2,BYE EXIT SYSTEM

0350**

0351*** PRINT NAME TABLE FOR OPERATORS **

0352**

0353 04006 032003 LET OCT 32003 BITS 15-9 OF THE LABELLED WORD

0354 04007 046105 ASC 2,LET ARE THE BASIC CODE OPERATOR

0355 04011 033003 DIF OCT 33003 NUMBERS. BITS 2-0 ARE THE

0356 04012 042111 ASC 2,DIM LENGTH IN CHARACTERS OF THE

0357 04014 034003 COM OCT 34003 SYMBOL. THE ASCII VERSION OF

0358 04015 041517 ASC 2,COM THE SYMBOL FOLLOWS.

0359 04017 035003 DEF OCT 35003

0360 04020 042105 ASC 2,DEF

0361 04022 036003 REV OCT 36003

0362 04023 051105 ASC 2,REM

0363 04025 037004 GOTO OCT 37004

0364 04026 043517 ASC 2,GOTO

0365 04030 040002 IF OCT 40002

0366 04031 044506 ASC 1,IF

0367 04032 041003 FOR OCT 41003

0368 04033 043117 ASC 2,FOR

0369 04035 042004 NEXT OCT 42004

0370 04036 047105 ASC 2,NEXT

0371 04040 043005 GOSUB OCT 43005

0372 04041 043517 ASC 3,GOSUB

0373 04044 044006 RTRN OCT 44006

0374 04045 051105 ASC 3,RETURN

0375 04050 045003 END OCT 45003

0376 04051 042516 ASC 2,END

0377 04053 046004 STF OCT 46004

0378 04054 051524 ASC 2,STOP

0379 04056 047004 WAIT OCT 47004

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0380	04057	053501		ASC 2, WAIT
0381	04061	050004	CALL	OCT 50004
0382	04062	041501		ASC 2, CALL
0383	04064	051004	DATA	OCT 51004
0384	04065	042101		ASC 2, DATA
0385	04067	052004	READ	OCT 52004
0386	04070	051105		ASC 2, READ
0387	04072	053005	PRINT	OCT 53005
0388	04073	050122		ASC 3, PRINT
0389	04076	054005	INPUT	OCT 54005
0390	04077	044516		ASC 3, INPUT
0391	04102	055007	KSTUR	OCT 55007
0392	04103	051105		ASC 4, RESTORE
0393	04107	056003	MAT	OCT 56003
0394	04110	046501		ASC 2, MAT
0395	04112	057004	THEN	OCT 57004
0396	04113	052110		ASC 2, THEN
0397	04115	060002	TO	OCT 60002
0398	04116	052117		ASC 1, TO
0399	04117	061004	STEP	OCT 61004
0400	04120	051524		ASC 2, STEP
0401	04122	027003	NOT	OCT 27003
0402	04123	047117		ASC 2, NOT
0403	04125	026003	AND	OCT 26003
0404	04126	040516		ASC 2, AND
0405	04130	025002	UR	OCT 25002
0406	04131	047522		ASC 1, OR
0407	04132	030002	GTE	OCT 30002
0408	04133	037075		ASC 1, >=
0409	04134	031002	LTE	OCT 31002
0410	04135	036075		ASC 1, <=
0411	04136	017002	AUNEQ	OCT 17002
0412	04137	036076		ASC 1, <>
0413*				ALTERNATE UNEQUAL SIGN
0414	04140	001003	TAB	OCT 1003
0415	04141	052101		ASC 2, TAB
0416	04143	002003	SIN	OCT 2003
0417	04144	051511		ASC 2, SIN
0418	04146	003003	COS	OCT 3003
0419	04147	041517		ASC 2, COS
0420	04151	004003	TAN	OCT 4003
0421	04152	052101		ASC 2, TAN
0422	04154	005003	ATN	OCT 5003
0423	04155	040524		ASC 2, ATN
0424	04157	006003	EXFN	OCT 6003
0425	04160	042530		ASC 2, EXP
0426	04162	007003	LOG	OCT 7003
0427	04163	046117		ASC 2, LOG
0428	04165	010003	ABS	OCT 10003
0429	04166	040502		ASC 2, ABS
0430	04170	011003	SQR	OCT 11003
0431	04171	051521		ASC 2, SQR
0432	04173	012003	INT	OCT 12003
0433	04174	044516		ASC 2, INT
0434	04176	013003	RNL	OCT 13003
0435	04177	051116		ASC 2, RND

THIS SECTION HAS THE PRE-DEFINED
FUNCTIONS. HERE BITS 13-9 ARE
THE IDENTIFYING NUMBER OF THE
FUNCTION.

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0436	04201	014003	SGN	OCT 14003	
0437	04202	051507		ASC 2,SON	
0438	04204	015003	ZER	OCT 15003	MATRIX FUNCTIONS
0439	04205	055105		ASC 2,ZER	
0440	04207	016003	CON	OCT 16003	
0441	04210	041517		ASC 2,CON	
0442	04212	017003	IDN	OCT 17003	
0443	04213	044504		ASC 2, IDN	
0444	04215	020003	INV	OCT 20003	
0445	04216	044516		ASC 2, INV	
0446	04220	021003	TRN	OCT 21003	
0447	04221	052122		ASC 2, TRN	

0448**

0449*** TABLE SEARCH FOR MULTICHA RACTER SYMBOLS **

0450**

0451	04223	000000	TBSRH	NOP	
0452	04224	072333		STA TABLE	STORE TABLE ADDRESS
0453	04225	074167		STB LNGTH	STORE -(NUMBER OF ENTRIES)
0454	04226	060132		LDA BADDR	SAVE
0455	04227	070163		STA TEMP3	INPUT
0456	04230	060133		LDA CCNT	BUFFER
0457	04231	070164		STA TEMP4	STATUS
0458	04232	060135		LDA SBPTR	INITIALIZE END-OF-SYMBOL
0459	04233	072351		STA SMEND	POINTER
0460	04234	002404		CLA,INA	COUNT FIRST CHARACTER OF
0461	04235	072556		STA SLENG	SYMBOL
0462	04236	160135		LDA SBPTR,I	FETCH PARTIAL SYMBOL
0463	04237	010374		AND B177	TWO
0464	04240	150135		CPA SBPTR,I	CHARACTERS?
0465	04241	002001		RSS	NO
0466	04242	026265		JMP TSR10	YES
0467	04243	001727		ALF,ALF	LEFT-JUSTIFY
0468	04244	030345		IOR .32	FIRST CHARACTER AND
0469	04245	170135		STA SBPTR,I	APPEND BLANK
0470	04246	015614	TSRC1	JSB GETCR	FETCH NEXT CHARACTER
0471	04247	026326		JMP TSRC9	END-OF-STATEMENT
0472	04250	066556		LDB SLENG	CHECK FOR
0473	04251	054331		CPB .7	IMPOSSIBLE LENGTH
0474	04252	026326		JMP TSRC9	
0475	04253	004010		SLB	EVEN-NUMBERED CHARACTER?
0476	04254	026262		JMP TSRC2	YES
0477	04255	036351		ISZ SMEND	NO, FETCH FRESH WORD,
0478	04256	001727		ALF,ALF	LEFT-JUSTIFY CHARACTER,
0479	04257	030345		IUR .32	APPEND BLANK,
0480	04260	172351		STA SMEND,I	AND STORE
0481	04261	026265		JMP TSR10	
0482	04262	040450	TSFC2	ADA M32	DELETE BLANK,
0483	04263	142351		ADA SMEND,I	FILL SECOND CHARACTER,
0484	04264	172351		STA SMEND,I	AND STORE
0485	04265	036556	TSF10	ISZ SLENG	COUNT IT
0486	04266	064167		LDB LNGTH	INITIALIZE TABLE LENGTH
0487	04267	074165		STB COUNT	COUNTER
0488	04270	062333		LDA TABLE	
0489	04271	072513	TSFC3	STA TBLPT	SET TABLE POINTER
0490	04272	162513		LDA TBLPT,I	EXTRACT SYMBOL LENGTH
0491	04273	010331		AND .7	FROM TABLE AND COMPARE

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0492	04274	052556	CPA	SLENG	WITH CURRENT SYMBOL
0493	04275	026304	JMP	TSRC5	EQUAL?
0494	04276	040326	TSRC4	ADA .3	DIFFERENT,
0495	04277	001100		ARS	UPDATE
0496	04300	042513		ADA TBLPT	TABLE POINTER
0497	04301	034165		ISZ COUNT	MORE ENTRIES?
0498	04302	026271		JMP TSRC3	YES
0499	04303	026246		JMP TSRC1	NO
0500	04304	066513	TSRC5	LDB TBLPT	SET POINTER TO
0501	04305	076537		STB TS PTR	TABLE SYMBOL
0502	04306	064135		LDB SB PTR	SET (B) TO INPUT
0503	04307	026313		JMP TSRC7	SYMBOL POINTER
0504	04310	056351	TSRC6	CPB SMEND	ALL OF SYMBOL CONSIDERED?
0505	04311	026321		JMP TSRC8	YES, MATCH OCCURRED
0506	04312	006004		INB	NO, INCREMENT
0507	04313	036537	TSRC7	ISZ TS PTR	SYMBOL POINTERS
0508	04314	162537		LDA TS PTR, I	FETCH WORD FROM TABLE
0509	04315	150001		CPA 1,I	MATCH WITH INPUT SYMBOL?
0510	04316	026310		JMP TSRC6	YES
0511	04317	062556		LDA SLENG	NO, WRONG
0512	04320	026276		JMP TSRC4	SYMBOL
0513	04321	162513	TSRC8	LDA TBLPT, I	EXTRACT
0514	04322	010420		AND OPM SK	SYMBOL CODE
0515	04323	170135		STA SB PTR, I	
0516	04324	036223		ISZ TBSRH	AND RETURN VIA
0517	04325	126223		JMP TBSRH, I	'SUCCESS' EXIT
0518	04326	060163	TSRC9	LDA TEMP3	RESTORE
0519	04327	070132		STA BADDR	INPUT
0520	04330	060164		LDA TEMP4	BUFFER
0521	04331	070133		STA CCNT	STATUS
0522	04332	126223		JMP TBSRH, I	'FAILURE' EXIT
0523**					

0524*** FETCH AND RECORD PROGRAM INTEGER **

0525**

0526	04333	000000	PRGIN	NOP	
0527	04334	160135		LDA SB PTR, I	SET
0528	04335	030470		IOR FLGBT	'INTEGER
0529	04336	040326		ADA .3	FOLLOWS'
0530	04337	170135		STA SB PTR, I	OPERAND
0531	04340	162333		LDA PRGIN, I	GIVE ADDRESS
0532	04341	072346		STA PRGII	TO INTCK
0533	04342	034135		ISZ SB PTR	
0534	04343	015614		JSB GETCK	
0535	04344	014477	SYE25	JSB ERROR	
0536	04345	016351		JSB INTCK	FETCH
0537	04346	000000	PRGII	NOP	
0538	04347	036333		ISZ PRGIN	
0539	04350	126333		JMP PRGIN, I	

0540**

0541*** BUILD AN INTEGER **

0542**

0543	04351	000000	INTCK	NOP	CHARACTER IN (A)
0544	04352	006400		CLB	STORE
0545	04353	076556		STB INTGR	PARTIAL RESULT
0546	04354	015570	INTC1	JSB DIGCK	DIGIT?
0547	04355	026373		JMP INTC2	NO

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0548	04356	103101	CLO	
0549	04357	066556	LDB INTGR	MULTIPLY
0550	04360	044001	ADB 1	PARTIAL
0551	04361	044001	ADB 1	RESULT
0552	04362	046556	ADB INTGR	BY
0553	04363	044001	ADB 1	10
0554	04364	044000	ADB 0	ADD LATEST DIGIT
0555	04365	102201	SOC	OVERFLOW?
0556	04366	026344	JMP SYE25	YES
0557	04367	076556	STB INTGR	STORE PARTIAL RESULT
0558	04370	015614	JSB GETCR	NO, FETCH
0559	04371	060334	LDA .10	NEXT CHARACTER
0560	04372	026354	JMP INTC1	
0561	04373	066556	INTC2 LDB INTGR	ZERO
0562	04374	006003	SZB,RSS	INTEGER?
0563	04375	026344	JMP SYE25	YES
0564	04376	174135	STB SBPTR,I	NO, RECORD IT
0565	04377	166351	LDB INTCK,I	INTEGER
0566	04400	164001	LDB 1,I	TOO
0567	04401	046556	ADB INTGR	LARGE?
0568	04402	006021	SSB,RSS	
0569	04403	026344	JMP SYE25	YES
0570	04404	066556	LDB INTGR	NO,
0571	04405	034135	ISZ SBPTK	RETURN WITH
0572	04406	036351	ISZ INTCK	INTEGER
0573	04407	126351	JMP INTCK,I	IN (B)
0574**				
0575***			PROCESS CHARACTER STRING	**
0576**				
0577	04410	000000	CHRST NOP	
0578	04411	070162	STA TEMP2	RECORD TERMINATOR CHARACTER
0579	04412	060334	LDA .10	DUMMY
0580	04413	070476	STA BLANK	DELETE CHARACTER
0581	04414	015614	CHRS1 JSB GETCR	
0582	04415	026433	JMP CHRS3	TO END-OF-STATEMENT EXIT
0583	04416	050162	CPA TEMP2	TERMINATOR CHARACTER?
0584	04417	026432	JMP CHRS2	YES
0585	04420	130135	IOR SBPTR,I	NO, FILL
0586	04421	170135	STA SBPTK,I	SECOND CHARACTER
0587	04422	015614	JSB GETCR	
0588	04423	026433	JMP CHRS3	TO END-OF-STATEMENT EXIT
0589	04424	050162	CPA TEMP2	TERMINATOR CHARACTER?
0590	04425	026432	JMP CHRS2	YES
0591	04426	034135	ISZ SBPTR	NO, MOVE TO NEW WORD
0592	04427	001727	ALF,ALF	AND STORE
0593	04430	170135	STA SBPTR,I	FIRST CHARACTER
0594	04431	026414	JMP CHRS1	
0595	04432	036410	CHRS2 ISZ CHRST	SET (P+2) EXIT
0596	04433	034135	CHRS3 ISZ SBPTR	MOVE TO NEXT BUFFER WORD
0597	04434	060345	LDA .32	RESTORE BLANK AS
0598	04435	070476	STA BLANK	DELETE CHARACTER
0599	04436	126410	JMP CHRST,I	

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0601**				
0602***	DELETE STATEMENT	***		
0603**				
0604 04437 160134	DLSTM	LDA SBUFA,I	LOAD SEQUENCE NUMBER	
0605 04440 016513		JSB FNDPS	FIND STATEMENT TO BE DELETED	
0606 04441 124204		JMP PEXMA,I	DOESN'T	
0607 04442 124204		JMP PEXMA,I	EXIST	
0608 04443 002400		CLA	ZERO WORD SKIP FOR DESTINATION	
0609 04444 006004		INB	ADDRESS OF SOURCE WORD SKIP IN B	
0610 04445 016537		JSB CLPRG	CLOSE UP PROGRAM	
0611 04446 124204		JMP PEXMA,I	EXIT TO PHASE 1 WAIT	
0612*				
0613***		***		
0614**	ACCEPT STATEMENT	**		
0615***		***		
0616*				
0617 04447 060134	ACTST	LDA SBUFA	COMPUTE	
0618 04450 003004		CMA,INA	LENGTH	
0619 04451 040135		ADA SBPTR	OF STATEMENT	
0620 04452 170160		STA TEMP,I	AND RECORD IT	
0621 04453 160134		LDA SBUFA,I	LOAD SEQUENCE NUMBER	
0622 04454 016513		JSB FNDPS	SEARCH ON SEQUENCE NUMBER	
0623 04455 026472		JMP ACCS1	APPEND STATEMENT TO PROGRAM	
0624 04456 026507		JMP ACCS4	INSERT STATEMENT IN PROGRAM	
0625 04457 006004		INB	REPLACE STATEMENT IN PROGRAM	
0626 04460 160001		LDA 1,I	COMPARE LENGTHS OF	
0627 04461 003004		CMA,INA	STATEMENT BEING REPLACED	
0628 04462 140160		ADA TEMP,I	AND STATEMENT	
0629 04463 002003		SZA,RSS	REPLACING IT	
0630 04464 026474		JMP ACCS2	EQUAL	
0631 04465 002021		SSA,RSS		
0632 04466 026510		JMP ACCS4+1	SHORTER	
0633 04467 160160		LDA TEMP,I	LONGER,	
0634 04470 016537		JSB CLPRG	CLOSE UP PROGRAM	
0635 04471 026474		JMP ACCS2		
0636 04472 160160	ACCS1	LDA TEMP,I	LOAD PROGRAM SPACE REQUIREMENT	
0637 04473 016556		JSB OVCHK	SUFFICIENT PROGRAM SPACE LEFT?	
0638 04474 006400	ACCS2	CLB	YES, SET COUNTER TO ZERO	
0639 04475 060134		LDA SBUFA	INITIALIZE	
0640 04476 070162		STA TEMP2	SOURCE ADDRESS	
0641 04477 160162	ACCS3	LDA TEMP2,I	TRANSFER WORD FROM	
0642 04500 170163		STA TEMP3,I	S-BUFFER TO PROGRAM SPACE	
0643 04501 034162		ISZ TEMP2	INCREMENT SOURCE AND	
0644 04502 034163		ISZ TEMP3	DESTINATION ADDRESSES	
0645 04503 006004		INB	BUMP COUNTER	
0646 04504 154160		CPB TEMP,I	ENTIRE STATEMENT MOVED?	
0647 04505 124204		JMP PEXMA,I	YES	
0648 04506 026477		JMP ACCS3	NO	
0649 04507 160160	ACCS4	LDA TEMP,I	LOAD PROGRAM SPACE REQUIREMENT	
0650 04510 016556		JSB OVCHK	SUFFICIENT PROGRAM SPACE LEFT?	
0651 04511 014554		JSB MVTOH	MAKE	
0652 04512 026474		JMP ACCS2	ROOM	

PAGE 0071 #04 CHECK SYNTAX AND TRANSLITERATE

0654**

0655*** FIND SEQUENTIAL POSITION **

0656**

0657	04513	000000	FNIPS NOP	
0658	04514	070163	STA TEMP3	SAVE SEQUENCE NUMBER
0659	04515	064112	LDB PBUFF	STARTING ADDRESS
0660	04516	054113	CPB PBPTR	END OF PROGRAM?
0661	04517	026535	JMP FNDP4	YES, EXIT VIA (P+1)
0662	04520	160001	LDA 1,I	SUBTRACT PROGRAM
0663	04521	003004	CMA,INA	SEQUENCE NUMBER FROM
0664	04522	040163	ADA TEMP3	S-BUFFER SEQUENCE NUMBER
0665	04523	002003	SZA,RSS	EQUAL?
0666	04524	026533	JMP FNDP2	YES, SET EXIT TO (P+3)
0667	04525	002020	SSA	NO, P-SEQ NO > S-SEQ NO ?
0668	04526	026534	JMP FNDP3	YES, SET EXIT TO (P+2)
0669	04527	060001	LDA 1	POINT (A) TO
0670	04530	002004	INA	PROGRAM ADDRESS INCREMENT
0671	04531	144000	ADB 0,I	COMPUTE NEW ADDRESS
0672	04532	026516	JMP FNDP1	
0673	04533	036513	FNIP2 ISZ FNDPS	SAVE STATEMENT ADDRESS
0674	04534	036513	FNIP3 ISZ FNDPS	
0675	04535	074163	FNDP4 STB TEMP3	
0676	04536	126513	JMP FNDPS,I	

0677**

0678*** DELETE SPACE IN PROGRAM **

0679**

0680	04537	000000	CLFRG NOP	REFERENCE LOCATION IN TEMP3
0681	04540	040163	ADA TEMP3	SKIP (A) LOCATIONS FROM TEMP3
0682	04541	070164	STA TEMP4	AND SAVE DESTINATION ADDRESS
0683	04542	164001	LDB 1,I	SKIP TO END OF STATEMENT BEING
0684	04543	044163	ADB TEMP3	DELETED, SOURCE ADDRESS IN (B)
0685	04544	054113	CLPR1 CPB PBPTR	ALL OF PROGRAM MOVED?
0686	04545	026553	JMP CLPR2	YES
0687	04546	160001	LDA 1,I	NO, MOVE WORD FROM SOURCE TO
0688	04547	170164	STA TEMP4,I	DESTINATION ADDRESS
0689	04550	034164	ISZ TEMP4	INCREMENT DESTINATION ADDRESS
0690	04551	006004	INB	INCREMENT SOURCE ADDRESS
0691	04552	026544	JMP CLPR1	
0692	04553	060164	CLPR2 LDA TEMP4	SET END-OF-PROGRAM
0693	04554	070113	STA PBPTR	POINTER
0694	04555	126537	JMP CLPRG,I	

0695**

0696*** CHECK FOR PROGRAM SPACE OVERFLOW **

0697**

0698	04556	000000	OVCHK NOP	NEW WORD REQUIREMENT IN (A)
0699	04557	064113	LDB PBPTR	SET SOURCE ADDRESS
0700	04560	074162	STB TEMP2	FOR PROGRAM RELOCATION
0701	04561	044000	ADB 0	SET DESTINATION
0702	04562	074164	STB TEMP4	ADDRESS
0703	04563	007004	CMB,INB	ENOUGH
0704	04564	044106	ADB LWBM	FREE
0705	04565	006020	SSB	SPACE?
0706	04566	124271	JMP FSCEF,I	NO, PROGRAM SPACE OVERFLOW
0707	04567	064164	LDB TEMP4	YES, RELOCATE FREE
0708	04570	074113	STB PBPTR	PROGRAM SPACE POINTER
0709	04571	126556	JMP OVCHK,I	

LIST PROGRAM
PRE-EXECUTION PROCESSING

PAGE 0072 #05 LIST PROGRAM

0002*				
0003*	*****			
0004***		***		
0005***	LIST THE PROGRAM	***		
0006***		***		
0007*	*****	*****		
0008*				
0009	04572 064112	LIST	LDB PBUFF	INITIALIZE TO FIRST STATEMENT OF PROGRAM
0010	04573 074157		STB TEMPS	SEQUENCE NUMBER GIVEN?
0011	04574 015614		JSB GETCR	NO
0012	04575 026607		JMP LIST0	YES, SET FOR
0013	04576 064131		LDB .BUFA	SEQUENCE NUMBER
0014	04577 074135		STB SBPTR	FETCH
0015	04600 114216		JSB INCHK, I	IT
0016	04601 000463		DEF MAXSN	LOAD SEQUENCE NUMBER
0017	04602 160131		LDA .BUFA, I	FIND INTIAL STATEMENT
0018	04603 016513		JSB FNDPS	
0019	04604 124205		JMP RDYDA, I	
0020	04605 000000		NOP	SAVE
0021	04606 074157		STB TEMPS	ADDRESS
0022	04607 006400	LIST0	CLB	HIGH-SPEED
0023	04610 054136		CPB TFLAG	PUNCH?
0024	04611 026614		JMP LIST1	NO
0025	04612 060373		LDA B133	YES, EMIT
0026	04613 114127		JSB LISTR, I	LEADER
0027	04614 064157	LIST1	LDB TEMPS	MORE
0028	04615 054113		CPB PBPTK	PROGRAM?
0029	04616 027003		JMP LIS13	NO
0030	04617 003400		CCA	INITIALIZE
0031	04620 040134		ADA SBUFA	OUTPUT BUFFER
0032	04621 070132		STA BADDR	POINTER
0033	04622 002400		CLA	INITIALIZE
0034	04623 070133		STA CCNT	CHARACTER COUNT
0035	04624 160157		LDA TEMPS, I	OUTPUT
0036	04625 017015		JSB OUTIN	SEQUENCE NUMBER
0037	04626 060476		LDA BLANK	OUTPUT
0038	04627 015715		JSB OUTCR	BLANK
0039	04630 034157		ISZ TEMPS	FETCH
0040	04631 160157		LDA TEMPS, I	STATEMENT LENGTH
0041	04632 003004		CMA,INA	SET
0042	04633 002004		INA	WORD
0043	04634 071467		STA SLWST	COUNTER
0044	04635 034157	LIST3	ISZ TEMPS	MORE
0045	04636 035467		ISZ SLWST	STATEMENT?
0046	04637 026644		JMP LIST4	YES
0047	04640 064134	LIST2	LDB SBUFA	OUTPUT
0048	04641 060133		LDA CCNT	
0049	04642 114127		JSB LISTR, I	STATEMENT
0050	04643 026614		JMP LIST1	
0051	04644 160157	LIST4	LDA TEMPS, I	
0052	04645 010420		AND OPMSK	NULL OPERATOR?
0053	04646 002003		SZA,RSS	YES
0054	04647 026670		JMP LIST5	NO, SAVE OPERATOR
0055	04650 070162		STA TEMP2	SINGLE
0056	04651 001727		ALF,ALF	
0057	04652 001100		ARS	

PAGE 0073 #05 LIST PROGRAM

0058	04653	064000	LDB 0	CHARACTER
0059	04654	040446	ADA M21	
0060	04655	002021	SSA,RSS	OPERATOR?
0061	04656	026772	JMP LIS12	NO
0062	04657	005000	BLS	YES
0063	04660	006004	INB	LOAD
0064	04661	044301	ADB FOPBS	SYMBOL'S
0065	04662	160001	LDA 1,I	ASCII WORD
0066	04663	001727	ALF,ALF	ADJUST
0067	04664	010376	AND MSK0	CHARACTER
0068	04665	050347	CPA .34	" ?
0069	04666	027011	JMP LIS14	YES
0070	04667	015715	JSB OUTCR	NO
0071	04670	160157	LIST5 LDA TEMP\$,I	SAVE
0072	04671	010425	AND OPDMK	OPERAND
0073	04672	070163	STA TEMP3	EXTRACT OPERAND TYPE
0074	04673	010423	AND TYPFL	SET LFLAG FALSE
0075	04674	072333	STA LFLAG	FLAG BIT SET?
0076	04675	002020	SSA	YES
0077	04676	026732	JMP LIST9	NO, NULL OPERAND?
0078	04677	002003	SZA,RSS	YES
0079	04700	026635	JMP LIST3	FUNCTION?
0080	04701	050336	CPA .15	YES
0081	04702	026725	JMP LIST8	
0082	04703	040435	LIST6 ADA M5	LETTER-DIGIT COMBINATION?
0083	04704	002020	SSA	NO
0084	04705	026710	JMP LIST7	YES, SET
0085	04706	003400	CCA	LFLAG FALSE
0086	04707	072333	STA LFLAG	
0087	04710	060163	LIST7 LDA TEMP3	RESTORE AND
0088	04711	001727	ALF,ALF	OUTPUT
0089	04712	001700	ALF	LETTER
0090	04713	010374	AND B177	DIGIT FOLLOWS?
0091	04714	040363	ADA B100	NO
0092	04715	015715	JSB OUTCR	YES
0093	04716	036333	ISZ LFLAG	RESTORE
0094	04717	026635	JMP LIST3	DIGIT
0095	04720	060163	LDA TEMP3	OUTPUT DIGIT
0096	04721	010336	AND .15	
0097	04722	040353	ADA .43	OUTPUT
0098	04723	015715	JSB OUTCR	'F'
0099	04724	026635	JMP LIST3	OUTPUT
0100	04725	060365	LIST8 LDA F	'N'
0101	04726	015715	JSB OUTCR	
0102	04727	060371	LDA N	NUMBER?
0103	04730	015715	JSB OUTCR	NO
0104	04731	026710	JMP LIST7	YES
0105	04732	020470	LIST9 XOR FLGBT	SET SIGN FLAG FALSE
0106	04733	002102	CLE,SZA	
0107	04734	026751	JMP LIS10	
0108	04735	034157	ISZ TEMPS	
0109	04736	070153	STA SIGN	
0110	04737	160157	LDA TEMPS,I	
0111	04740	034157	ISZ TEMPS	
0112	04741	164157	LDB TEMPS,I	
0113	04742	035467	ISZ SLWST	

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0114	04743	035467	ISZ SLWST	
0115	04744	002020	SSA	NEGATIVE NUMBER?
0116	04745	002300	CCE	YES, SET SIGN FLAG TRUE
0117	04746	114220	JSB NUMOA,I	
0118	04747	000000	NOP	
0119	04750	026635	JMP LISTS	
0120	04751	050326	LIS10 CPA .3	INTEGER?
0121	04752	026765	JMP LIS11	YES
0122	04753	050336	CPA .15	NO, FUNCTION?
0123	04754	002001	RSS	YES
0124	04755	026703	JMP LIST6	NO, MUST BE A PARAMETER
0125	04756	060163	LDA TEMP3	COMPUTE
0126	04757	001722	ALF,RAL	PRINT
0127	04760	010420	AND OPMSK	TABLE
0128	04761	070162	STA TEMP2	CODE
0129	04762	064322	LDB ATAB	OUTPUT
0130	04763	017077	JSB MCOUT	FUNCTION NAME
0131	04764	026635	JMP LIST3	
0132	04765	034157	LIS11 ISZ TEMPS	OUTPUT
0133	04766	035467	ISZ SLWST	
0134	04767	160157	LDA TEMPS,I	INTEGER
0135	04770	017015	JSB OUTIN	
0136	04771	026635	JMP LIST3	OPERAND
0137	04772	060476	LIS12 LDA BLANK	OUTPUT
0138	04773	015715	JSB OUTCR	BLANK
0139	04774	064307	LDB STTYP	OUTPUT
0140	04775	017077	JSB MCOUT	OPERATOR
0141	04776	060415	LDA REMOP	WAS IT
0142	04777	050162	CPA TEMP2	A REM?
0143	05000	027056	JMP OUTS1	YES, OUTPUT REMARK
0144	05001	060476	LDA BLANK	NO, OUTPUT
0145	05002	026667	JMP LIST5-1	A BLANK
0146	05003	006400	LIS13 CLB	HIGH-SPEED
0147	05004	054136	CPB TFLAG	PUNCH?
0148	05005	124205	JMP RDYDA,I	NO
0149	05006	060373	LDA B133	YES, EMIT
0150	05007	114127	JSB LISTR,I	TRAILER
0151	05010	124205	JMP RDYDA,I	
0152	05011	015715	LIS14 JSB OUTCR	OUTPUT "
0153	05012	017055	JSB OUTST	OUTPUT QUOTE STRING
0154	05013	060347	LDA .34	OUTPUT
0155	05014	026667	JMP LIST5-1	
0156*		*		
0157**		OUTPUT AN INTEGER	**	
0158*		*		
0159	05015	000000	OUTIN NOP	INTEGER IN (A)
0160	05016	064434	LDB M4	SET
0161	05017	077522	STB DIGCT	DIGIT COUNTER
0162	05020	067132	LDB LDVSR	SET DIVISOR
0163	05021	076351	STB DIVSR	ADDRESS
0164	05022	006400	CLB	SET LEADING
0165	05023	076556	STB LDZRO	ZERO FLAG
0166	05024	166351	OUTII LDB DIVSR,I	NEGATE
0167	05025	007004	CMB,INB	AND STORE
0168	05026	076513	STB MIND	DIVISOR
0169	05027	007400	CCB	SET QUOTIENT

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0170	05030	006004	INB	TO ZERO
0171	05031	042513	ADA MIND	SUBTRACT DIVISOR FROM INTEGER
0172	05032	002021	SSA,RSS	NEGATIVE RESULT?
0173	05033	027030	JMP *-3	NO, INCREMENT QUOTIENT
0174	05034	142351	ADA DIVSH,I	YES, RECOVER REMAINDER
0175	05035	073077	STA MCOUT	AND SAVE IT
0176	05036	060001	LDA 1	
0177	05037	002002	SZA	ZERO?
0178	05040	027043	JMP OUTI2	NO
0179	05041	052556	CPA LDZRO	YES, LEADING ZERO?
0180	05042	027046	JMP OUTI3	YES
0181	05043	040357	OUTI2 ADA .48	NO, COMPUTE ASCII FOR DIGIT
0182	05044	072556	STA LDZRU	SET 'ZEROES SIGNIFICANT'
0183	05045	015715	JSB OUTCR	OUTPUT DIGIT
0184	05046	063077	OUTI3 LDA MCOUT	RETRIEVE REMAINDER
0185	05047	036351	ISZ DIVSH	SET FOR NEXT DIVISOR
0186	05050	037522	ISZ DIGCT	DIVISION NECESSARY?
0187	05051	027024	JMP OUTI1	YES
0188	05052	040357	ADA .48	NO, COMPUTE ASCII FOR LAST
0189	05053	015715	JSB OUTCR	DIGIT AND OUTPUT IT
0190	05054	127015	JMP OUTIN,I	
0191*			*	
0192**		OUTPUT A STRING **		
0193*		*		
0194	05055	000000	OUTST NOP	" ENTRY POINT
0195	05056	160157	OUTS1 LDA TEMPS,I	REM ENTRY POINT
0196	05057	010374	AND B177	OUTPUT SECOND CHARACTER
0197	05060	002002	SZA	OF WORD IF
0198	05061	015715	JSB OUTCR	NOT NULL
0199	05062	034157	ISZ TEMPS	BUMP POINTER
0200	05063	035467	ISZ SLWST	REM COMPLETED?
0201	05064	002001	RSS	NO
0202	05065	026640	JMP LIST2	YES
0203	05066	160157	LDA TEMPS,I	EXTRACT
0204	05067	001727	ALF,ALF	FIRST CHARACTER
0205	05070	010374	AND B177	OF WORD
0206	05071	050325	CPA .2	EXIT
0207	05072	127055	JMP OUTST,I	IF A
0208	05073	050326	CPA .3	CLOSING
0209	05074	127055	JMP OUTST,I	QUOTE
0210	05075	015715	JSB OUTCR	OUTPUT
0211	05076	027056	JMP OUTS1	CHARACTER
0212*		*		
0213**		LIST A MULTICHARACTER SYMBOL **		
0214*		*		
0215	05077	000000	MCCUT NOP	
0216	05100	160001	MCCU1 LDA 1,I	LOAD INFORMATION WORD
0217	05101	010420	AND OPMSK	COMPARE WITH
0218	05102	050162	CPA TEMP2	OPERATOR CODE
0219	05103	027112	JMP MC0U2	EQUAL
0220	05104	160001	LDA 1,I	UNEQUAL,
0221	05105	010331	AND .7	COMPUTE
0222	05106	040326	ADA .3	ENTRY
0223	05107	001100	ARS	LENGTH
0224	05110	044000	ADB 0	COMPUTE ADDRESS OF NEXT ENTRY
0225	05111	027100	JMP MC0U1	

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0226	05112	160001	MCCU2	LDA 1,I	COMPUTE
0227	05113	010331		AND .7	ENTRY
0228	05114	003004		CMA,INA	LENGTH
0229	05115	073522		STA DIGCT	AND SAVE IT
0230	05116	006104		CLE,INB	SET FOR FIRST CHARACTER
0231	05117	074163		STB TEMP3	SAVE SYMBOL ADDRESS
0232	05120	160163	MCCU3	LDA TEMP3,I	LOAD WORD
0233	05121	002041		SEZ,RSS	FIRST CHARACTER?
0234	05122	001727		ALF,ALF	YES, POSITION IT
0235	05123	010374		AND B177	EXTRACT CHARACTER
0236	05124	015715		JSB OUTCR	OUTPUT IT
0237	05125	002240		SEZ,CME	SET FOR NEXT CHARACTER
0238	05126	034163		ISZ TEMP3	MOVE TO NEXT WORD OF SYMBOL
0239	05127	037522		ISZ DIGCT	MORE CHARACTERS?
0240	05130	027120		JMP MC0U3	YES
0241	05131	127077		JMP MCOUT,I	
0242*					
0243*					
0244	05132	005133	LDVSR	DEF *+1	
0245	05133	023420		DEC 10000	
0246	05134	001750		DEC 1000	
0247	05135	000144		DEC 100	
0248	05136	000012		DEC 10	
0249*					
0250*					
0251	03530		SFLAG	EQU ARRY\$	
0252	04333		TABLE	EQU PRGIN	
0253	00167		LNGTH	EQU TEMPS+8	
0254	04351		SMEND	EQU INTCK	
0255	04556		SLENG	EQU OVCHK	
0256	04513		TBLPT	EQU FNDPS	
0257	04537		TSFTR	EQU CLPRG	
0258	04556		INTGR	EQU OVCHK	
0259	04333		LFLAG	EQU PRGIN	
0260	04351		DIVSR	EQU INTCK	
0261	04556		LDZRO	EQU OVCHK	
0262	04513		MIND	EQU FNDPS	

PAGE 0077 #05 PRE-EXECUTION PROCESSING

0264* *****
 0265* PHASE 2 OF THE COMPILER
 0266* *****
 0267*
 0268* THIS PHASE HAS THE FOLLOWING 3 FUNCTIONS:
 0269* 1. SYMBOL TABLE CONSTRUCTION
 0270* 2. FOR LOOP CHECKING
 0271* 3. ARRAY STORAGE ALLOCATION
 0272*
 0273 05137 060113 MFASE LDA PBPTR NULL
 0274 05140 050112 CPA PBUFF PROGRAM?
 0275 05141 124205 JMP RDYDA,I YES
 0276 05142 070115 STA FCORE NO, SET FOR-TABLE POINTER
 0277 05143 060110 LDA FWAM
 0278 05144 070170 STA COML INITIALIZE COMMON POINTER
 0279 05145 060117 LDA SYMTA
 0280 05146 070116 STA SYMTF INITIALIZE SYMBOL TABLE POINTER
 0281 05147 060112 LDA PBUFF
 0282 05150 070135 STA MPTR INITIALIZE PROGRAM POINTER
 0283 05151 164135 MLCP1 LDB MPTR,I
 0284 05152 074145 STB .LNUM SET LINE NUMBER
 0285 05153 064135 LDB MPTR
 0286 05154 034135 ISZ MPTR
 0287 05155 144135 ADB MPTR,I COMPUTE LOCATION OF NEXT
 0288 05156 075515 STB MNPTK STATEMENT AND STORE THIS
 0289 05157 034135 ISZ MPTR
 0290 05160 160135 LDA MPTR,I FETCH THE FIRST WORD IN THE
 0291 05161 001100 MLC10 ARS STATEMENT AND SAVE
 0292 05162 001727 ALF,ALF THE STATEMENT TYPE
 0293 05163 010362 AND .63
 0294 05164 070146 STA TYPE
 0295 05165 050355 CPA .46 MAT STATEMENT?
 0296 05166 027176 JMP ML012 YES
 0297 05167 050343 CPA .30 NO, REM STATEMENT?
 0298 05170 074135 STB MPTR YES, SET TO SKIP IT
 0299 05171 050353 CPA .43 NO, PRINT STATEMENT?
 0300 05172 074135 STB MPTR YES, SET TO SKIP IT
 0301 05173 003400 CCA NO, SET
 0302 05174 070171 STA MWUNU 'FIRST VARIABLE'
 0303 05175 027212 JMP ML0P2+1 FLAG
 0304*
 0305 05176 060135 MLC12 LDA MPTR SEEK
 0306 05177 002004 INA SUBSIDIARY
 0307 05200 160000 LDA 0,I STATEMENT
 0308 05201 027161 JMP ML010 TYPE
 0309*
 0310 05202 010401 MLC13 AND MSK1 YES, ISOLATE OPERAND
 0311 05203 064135 LDB MPTR INDEX THE PROGRAM POINTER BY
 0312 05204 002003 SZA,RSS AN AMOUNT APPROPRIATE TO THE
 0313 05205 044325 ADB .2 OPERAND. THE FOLLOWING APPLIES
 0314 05206 050326 CPA .3 OPERAND = 0 ADD 2 TO POINTER
 0315 05207 006004 INB OPERAND = 3 ADD 1 TO POINTER
 0316 05210 074135 STB MPTR
 0317*
 0318 05211 034135 MLCP2 ISZ MPTR INCREMENT WORD-OF-STATEMENT PTR
 0319 05212 060135 LDA MPTR STATEMENT

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0320	05213	051515	CPA MNPTR	EXHAUSTED?
0321	05214	027272	JMP MLOP5	YES
0322	05215	160135	LDA MPTR,I	NO
0323	05216	002020	SSA	'CONSTANT' OPERAND?
0324	05217	027202	JMP MLO13	YES
0325	05220	010401	AND MSK1	NO
0326	05221	002003	SZA,RSS	NULL OPERAND?
0327	05222	027211	JMP MLOP2	YES
0328	05223	070157	STA MBOX1	NO, SAVE IT
0329	05224	010336	AND .15	PROGRAMMER-DEFINED
0330	05225	050336	CPA .15	FUNCTION?
0331	05226	027301	JMP MLOP6	YES
0332	05227	040434	ADA M4	NO
0333	05230	002020	SSA	ARRAY VARIABLE?
0334	05231	027320	JMP MLOP7	YES
0335	05232	060157	LDA MBOX1	NO, SIMPLE VARIABLE
0336	05233	114231	JSE SSYMA,I	ALREADY IN
0337	05234	006021	SSB,RSS	SYMBOL TABLE?
0338	05235	027244	JMP MLOP3	YES
0339	05236	060470	LDA MNEG	NO
0340	05237	064471	LDB MNEG+1	ENTER
0341	05240	070160	STA MBOX1+1	IT WITH
0342	05241	074161	STB MBOX1+2	'UNDEFINED'
0343	05242	060433	LDA M3	VALUE
0344	05243	017501	JSB ESYMT	
0345	05244	064146	MLCP3 LDB TYPE	
0346	05245	060157	LDA MBOX1	
0347	05246	054347	CPB .34	NEXT STATEMENT?
0348	05247	027261	JMP MLOP4	YES
0349	05250	054346	CPB .33	NO, FOR STATEMENT?
0350	05251	034171	ISZ MWDNO	YES, FIRST VARIABLE?
0351	05252	027211	JMP MLOP2	NO
0352	05253	034115	ISZ FCORE	DEMAND
0353	05254	064115	LDB FCORE	SPACE
0354	05255	054116	CPB SYMTF	FOR NEW
0355	05256	027511	JMP MER8-1	ENTRY
0356	05257	170115	STA FCORE,I	SAVE VARIABLE NAME
0357	05260	027211	JMP MLOP2	
0358*				
0359	05261	064115	MLCP4 LDB FCORE	FOR-TABLE
0360	05262	054113	CPB PBPTK	EMPTY?
0361	05263	014477	JSB ERROR	YES
0362	05264	150115	MER3 CPA FCORE,I	NO, MATCH LATEST ENTRY?
0363	05265	002001	RSS	YES
0364	05266	027263	JMP MER3-1	NO
0365	05267	044431	ADB M1	REMOVE
0366	05270	074115	STB FCORE	MATCHED
0367	05271	027211	JMP MLOP2	ENTRY
0368*				
0369	05272	050113	MLCP5 CPA PBPTK	PROGRAM EXHAUSTED?
0370	05273	002001	RSS	YES
0371	05274	027151	JMP MLOP1	NO
0372	05275	060146	LDA TYPE	YES
0373	05276	050350	CPA .37	END STATEMENT?
0374	05277	027407	JMP M1LOP	YES
0375	05300	014477	JSB ERROR	NO

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0376	05301	160135	MLCP6	LDA MPTR,I	ISOLATE
0377	05302	010420		AND OPMASK	PRECEDING OPERATOR
0378	05303	050414		CPA DEFOP	'DEF' ?
0379	05304	002001		RSS	YES
0380	05305	027211		JMP MLOP2	NO GO TO PROCESS NEXT WORD
0381	05306	060157		LDA MBOX1	SEARCH SYMBOL TABLE FOR
0382	05307	114231		JSB SSYMA,I	THE FUNCTION
0383	05310	006021		SSB,RSS	
0384	05311	014477		JSB ERROR	FOUND. ERROR MULTIPLY DEFINED
0385	05312	060135	MER4	LDA MPTR	
0386	05313	040326		ADA .3	ENTER THE FUNCTION INTO THE
0387	05314	070160		STA MBOX1+1	SYMBOL TABLE TOGETHER WITH
0388	05315	060432		LDA M2	ITS ENTRY POINT IN THE SOURCE
0389	05316	017501		JSB ESYMT	CODE
0390	05317	027211		JMP MLOP2	GO TO PROCESS THE NEXT WORD
0391*					
0392	05320	070001	MLCP7	STA 1	
0393	05321	060146		LDA TYPE	
0394	05322	050341		CPA .27	DIM STATEMENT?
0395	05323	027335		JMP MLOP8	YES
0396	05324	050342		CPA .28	NO, COM STATEMENT?
0397	05325	027335		JMP MLUP8	YES
0398	05326	017522		JSB MSYMT	NO, LOOK FOR IT IN SYMBOL TABLE
0399	05327	027211		JMP MLOP2	FOUND
0400	05330	002400		CLA	NOT THERE
0401	05331	070160		STA MBOX1+1	ENTER IT WITH
0402	05332	070161		STA MBOX1+2	DIMENSIONS AND
0403	05333	070162		STA MBOX1+3	DIMENSIONALITY
0404	05334	027370		JMP MLOP8	UNDEFINED
0405*					
0406	05335	034135	MLCP8	ISZ MPTR	PROCESS COM OR DIM STMT
0407	05336	034135		ISZ MPTR	
0408	05337	160135		LDA MPTR,I	PICK UP FIRST DIMENSION
0409	05340	001727		ALF,ALF	SHIFT TO M. S. PART OF WORD
0410	05341	054433		CPB M3	IS THIS A SINGLE DIMENSION ARRAY
0411	05342	027347		JMP *+5	YES, JUMP
0412	05343	034135		ISZ MPTR	NO, INDEX POINTER TO THE LOC.
0413	05344	034135		ISZ MPTR	OF SECOND DIMENSION AND PACK
0414	05345	130135		IOR MPTR,I	INTO A WITH THE FIRST DIMENSION
0415	05346	002001		RSS	
0416	05347	030324		IOR .1	
0417	05350	070161		STA MBOX1+2	SET UP TO STORE PACKED
0418	05351	070162		STA MBOX1+3	DIMENSIONS IN FORMAL AND ACTUAL
0419	05352	002400		CLA	SLOTS AND UNDEFINED FLAG IN
0420	05353	070160		STA MBOX1+1	STORAGE ALLOCATION SLOT
0421	05354	017522		JSB MSYMT	IN SYMBOL TABLE?
0422	05355	027373		JMP MLOP9	NO
0423	05356	060146		LDA TYPE	YES
0424	05357	050342		CPA .28	
0425	05360	002001		RS8	IS STMT A COM
0426	05361	027370		JMP MLOP8	NO, JUMP
0427	05362	060161		LDA MBOX1+2	YES PICK UP PACKED DIMENSIONS
0428	05363	015336		JSB MDIM	COMPUTE STORAGE REQUIRED
0429	05364	064170		LDB COML	POINTER TO NEXT FREE LOC IN COM
0430	05365	074160		STB MBOX1+1	STORE IN STORAGE ALLOCATION SLOT
0431	05366	044000		ADB 0	UPDATE POINTER BY THE AMOUNT OF

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0432	05367	074170	STB COML	STORAGE ASSIGNED.
0433	05370	060434	MLCP0 LDA M4	ENTER THE FOUR WORD ENTRY
0434	05371	017501	JSB ESYMT	PREVIOUSLY SET UP IN MBOX1 INTO
0435	05372	027211	JMP MLOP2	SYMBOL TABLE AND CONTINUE
0436*				
0437	05373	044325	MLCP9 ADB .2	CHECK THE FORMAL DIMENSIONS
0438	05374	160001	LDA 1,I	LOCATION TO SEE IF THE DIMENSION
0439	05375	002002	SZA	IS ALREADY DEFINED
0440	05376	014477	JSB ERROR	ERROR, DOUBLY DIMENSIONED
0441	05377	060146	MER5 LDA TYPE	
0442	05400	050342	CPA .28	COM STMT?
0443	05401	124270	JMP ESYN3,I	ERROR MISPLACED COM STMT
0444	05402	060161	LDA MBOX1+2	
0445	05403	170001	STA 1,I	STORE THESE DIMENSIONS IN FORMAL
0446	05404	006004	INB	AND ACTUAL SLOTS IN SYMBOL TABLE
0447	05405	170001	STA 1,I	ENTRY
0448	05406	027211	JMP MLOP2	GO TO PROCESS NEXT WORD
0449*				
0450*				THE SECTION WHICH FOLLOWS CHECKS
0451*				THAT ALL FOR LOOPS HAVE BEEN
0452*				TERMINATED, ASSIGNS THE STANDARD
0453*				DIMENSIONS TO UNDIMENSIONED ARRAYS
0454*				AND MAKES STORAGE ASSIGNMENTS FOR
0455*				ALL ARRAYS WHICH DO NOT APPEAR IN
0456*				A COM STMT
0457*				
0458	05407	060115	M1LOP LDA FCORE	ALL FORS
0459	05410	050113	CPA PBPTR	MATCHED?
0460	05411	002001	RSS	YES
0461	05412	014477	JSB ERROR	NO
0462	05413	064116	MER6 LDB SYMTF	
0463*				
0464	05414	054117	M2LOP CPB SYMTA	MORE SYMBOLS?
0465	05415	027466	JMP M4LOP	NO
0466	05416	160001	LDA 1,I	YES
0467	05417	010336	AND .15	ACCOUNT FOR
0468	05420	044325	ADB .2	A FUNCTION
0469	05421	050336	CPA .15	IS IT?
0470	05422	027414	JMP M2LOP	YES
0471	05423	006004	INB	NO, ACCOUNT FOR
0472	05424	040434	ADA M4	SIMPLE VARIABLE
0473	05425	002025	SSA,INA,RSS	IS IT?
0474	05426	027414	JMP M2LOP	YES
0475	05427	002003	SZA,RSS	NO, # OF SUBSCRIPTS KNOWN?
0476	05430	014477	JSB ERROR	NO
0477	05431	002004	MER10 INA	SAVE
0478	05432	070160	STA MBOX1+1	FLAG
0479	05433	074157	STB MBOX1	SAVE POINTER
0480	05434	160001	LDA 1,I	DEFINED
0481	05435	002002	SZA	ARRAY?
0482	05436	027445	JMP M3LOP	YES
0483	05437	063500	LDA STDIM	NO, LOAD
0484	05440	034160	ISZ MBOX1+1	APPROPRIATE
0485	05441	040333	ADA .9	STANDARD DIMENSIONS
0486	05442	170001	STA 1,I	RECORD AS
0487	05443	044431	ADB M1	FORMAL AND ACTUAL

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0488	05444	170001	STA 1,I	DIMENSIONS
0489	05445	015336	M3LOP JSB MDIM	SAVE STORAGE
0490	05446	070160	STA MBOX1+1	REQUIREMENT
0491	05447	064157	LDB MBOX1	LOAD
0492	05450	044432	ADB M2	ADDRESS OF
0493	05451	160001	LDA 1,I	ELEMENT SPACE
0494	05452	002002	SZA	DEFINED IN COM?
0495	05453	027464	JMP MER7	YES
0496	05454	060115	LDA FCORE	NO, USE CURRENT
0497	05455	170001	STA 1,I	FREE-CORE ADDRESS
0498	05456	040160	ADA MBOX1+1	UPDATE FREE-CORE
0499	05457	070115	STA FCORE	ADDRESS
0500	05460	003004	CMA,INA	OUT
0501	05461	040116	ADA SYMTF	OF
0502	05462	002020	SSA	SPACE?
0503	05463	014477	JSB ERROR	YES
0504	05464	044326	MER7 ADB .3	NO, ADVANCE POINTER
0505	05465	027414	JMP M2LUP	TO NEXT ENTRY
0506*				
0507	05466	064113	M4LUP LDB PBPTK	INITIALIZE ALL
0508	05467	054115	CPB FCORE	ARRAY ELEMENTS
0509	05470	124203	JMP FASE3,I	TO 'UNDEFINED'
0510	05471	060470	LDA MNEG	
0511	05472	170001	STA 1,I	
0512	05473	006004	INB	
0513	05474	060471	LDA MNEG+1	
0514	05475	170001	STA 1,I	
0515	05476	006004	INB	
0516	05477	027467	JMP M4LOP+1	
0517*				
0518	05500	005001	STIM OCT 5001	

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0520*      *****
0521*      ENTER SYMBOL TABLE SUBROUTINE
0522*      *****
0523*      TRANSFER -(A) WORDS FROM THE BUFFER ADDRESSED
0524*      BY MBUF TO THE TOP OF THE SYMBOL TABLE.
0525*      *****
0526*      *****
0527 05501 000000 ESYMT NOP
0528 05502 071467 STA MBIN1    SAVE NEGATIVE OF LENGTH OF ENTRY
0529 05503 040116 ADA SYMTF
0530 05504 070116 STA SYMTF
0531 05505 071536 STA MBIN2    MOVE SYMBOL TABLE START LOCATOR
0532 05506 003004 CMA,INA    UP BY THE LENGTH OF ENTRY
0533 05507 040115 ADA FCORE   CHECK THAT THE SYMBOL TABLE AND
0534 05510 002021 SSA,RSS    FOR TABLE DO NOT OVERLAP
0535 05511 014477 JSB ERROR  OVERLAP ERROR
0536 05512 067543 MER8 LDB MBUF  POINTER TO READ ENTRY
0537 05513 160001 LDA 1,I     TRANSFER ENTRY TO THE SYMBOL
0538 05514 171536 STA MBIN2,I TABLE
0539 05515 006004 INB
0540 05516 035536 ISZ MBIN2
0541 05517 035467 ISZ MBIN1
0542 05520 027513 JMP MER8+1
0543 05521 127501 JMP ESYMT,I RETURN
0544*
0545*      *****
0546*      SUBROUTINE TO SEARCH SYMBOL TABLE FOR AN ARRAY
0547*      *****
0548 05522 000000 MSYMT NOP      B GIVES ARRAY TYPE -3 = 1 DIM,
0549 05523 075467 STB MBIN1    -2 = 2DIM, -1 = UNDIMENSIONED
0550 05524 060157 LDA MBOX1    LOAD IDENTIFIER
0551 05525 114231 JSB SSYMA,I  SEARCH SYMBOL TABLE
0552 05526 006021 SSB,RSS
0553 05527 127522 JMP MSYMT,I  FOUND, RETURN
0554 05530 035467 ISZ MBIN1  IF ARRAY UNDIMENSIONED
0555 05531 002001 RSS
0556 05532 027541 JMP MSYM    JUMP TO NOT FOUND EXIT
0557 05533 035467 ISZ MBIN1  SET UP TO CHECK THAT ARRAY DOES
0558 05534 040325 ADA .2    NOT APPEAR IN THE TABLE WITH
0559 05535 040431 ADA M1    DIFFERENT DIMENSIONS. CHANGE
0560 05536 114231 JSB SSYMA,I  TYPE 2 TO 1 & TYPE 1 TO 2 AND
0561 05537 006021 SSB,RSS   SEARCH AGAIN
0562 05540 014477 JSB ERROR  FOUND, INCONSISTENT DIMENSIONS
0563 05541 037522 MSYM ISZ MSYMT NOT FOUND, INCREMENT RETURN
0564 05542 127522 JMP MSYMT,I ADDRESS AND RETURN
0565*
0566*
0567 05543 000157 MBUF DEF TEMPS
0568 00157    MBOX1 EQU TEMPS
0569 01467    MBIN1 EQU SLWST
0570 01536    MBIN2 EQU RSCHK
0571 00135    MPTR EQU SBPTR
0572 01515    MNPTR EQU OPCHK
0573 00170    COPL EQU TEMPS+9
0574 00171    MWDNO EQU TEMPS+10
0575 05522    DIGCT EQU MSYMT

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EXECUTE THE PROGRAM

PAGE 0083 #06 EXECUTE THE PROGRAM

0002*				
0003***			***	
0004** EVALUATE A FORMULA		**		
0005***		***		
0006*				
0007 05544 000000	FORMX	NOP	FORMULA BEGINS IN (TEMPS)	
0008 05545 006400		CLB	INITIALIZE OPERATOR	
0009 05546 015467		JSB SLWST	STACK	
0010 05547 160157	FORM1	LDA TEMPS,I	FETCH OPERAND	
0011 05550 034157		ISZ TEMPS	SET FOR NEXT WORD OF FORMULA	
0012 05551 010425		AND OPDMK	EXTRACT OPERAND	
0013 05552 070165		STA TEMPS+6	AND SAVE IT	
0014 05553 002003		SZA,RSS	NULL OPERAND?	
0015 05554 027567		JMP FORM2	YES	
0016 05555 015476		JSH BHSTP	SET STACK FOR OPERAND ADDRESS	
0017 05556 002020		SSA	FLAG BIT SET?	
0018 05557 027636		JMP FORM4	YES	
0019 05560 114231		JSB SSYMA,I	FETCH OPERAND ADDRESS	
0020 05561 006007		INB,SZB,RSS	EXISTANT?	
0021 05562 124267		JMP E8M1A,I	NO	
0022 05563 010336		AND .15	YES	
0023 05564 050336		CPA .15	FUNCTION?	
0024 05565 027651		JMP FORM6	YES	
0025 05566 174142		STB HSTPT,I	NO, STACK OPERAND ADDRESS	
0026 05567 160157	FORM2	LDA TEMPS,I	FETCH	
0027 05570 010420		AND OPMSK	OPERATOR	
0028 05571 001727		ALF,ALF	POSITION IT	
0029 05572 064000		LDB 0	LOAD ADDRESS OF	
0030 05573 044301		ADB FOPBS	OPERATOR'S INFORMATION WORD	
0031 05574 040440		ADA M8	NON-FORMULA	
0032 05575 002020		SSA	OPERATOR?	
0033 05576 006400		CLB	YES	
0034 05577 040451		ADA D53	NO, NON-FORMULA	
0035 05600 002021		SSA,RSS	OPERATOR?	
0036 05601 006400		CLB	YES	
0037 05602 002400		CLA	NO	
0038 05603 160001		LDA 1,I	LOAD INFORMATION WORD	
0039 05604 010401		AND MSK1	SAVE	
0040 05605 070166		STA TEMPS+7	PRECEDENCE	
0041 05606 120001		XOR 1,I	SAVE	
0042 05607 001100		ARS		
0043 05610 070165		STA TEMP8+6	IDENTIFICATION	
0044 05611 027617		JMP FOR11		
0045 05612 170140	FORM0	STA TSTPT,I	STACK HIGH WORD	
0046 05613 060140		LDA TSTPT	STACK OPERAND	
0047 05614 170142		STA HSTPT,I	ADDRESS	
0048 05615 002004		INA	STORE	
0049 05616 174000		STB 0,I	LOW WORD	
0050 05617 160141	FOR11	LDA LSTPT,I	DOES OPERATOR	
0051 05620 010376		AND MSK0	ON TOP OF	
0052 05621 003000		CMA	OPERATOR STACK	
0053 05622 040166		ADA TEMPS+7	HAVE HIGHER	
0054 05623 002020		SSA	PRECEDENCE?	
0055 05624 027751		JMP FORM9	YES, EXECUTE IT	
0056 05625 002001		RSS	NO	
0057 05626 034141	FOR10	ISZ LSTPT		

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0058	05627	064166	LDB TEMPS+7	RETRIEVE PRECEDENCE
0059	05630	044444	ADB M15	NO, LEFT PARENTHESIS
0060	05631	006020	SSB	OR LEFT BRACKET?
0061	05632	044336	ADB .15	NO, RESTORE PRECEDENCE
0062	05633	044165	ADB TEMPS+6	COMBINE IDENTIFICATION
0063	05634	015467	JSB SLWST	WITH PRECEDENCE AND STACK
0064	05635	027547	JMP FORM1	
0065	05636	050470	FORM4 CPA FLGBT	CONSTANT?
0066	05637	027645	JMP FORM5	YES
0067	05640	010336	AND .15	NO, PRE-DEFINED
0068	05641	050336	CPA .15	FUNCTION
0069	05642	027726	JMP FORM7	YES
0070	05643	064170	LDB TEMPS+9	NO, MUST BE A
0071	05644	027566	JMP FORM2-1	PARAMETER
0072	05645	064157	FORM5 LDB TEMPS	LOAD CONSTANT ADDRESS
0073	05646	034157	ISZ TEMPS	MOVE POINTER TO
0074	05647	034157	ISZ TEMPS	NEXT CODE WORD
0075	05650	027566	JMP FORM2-1	
0076	05651	074165	FORM6 STB TEMPS+6	SAVE SYMBOL TABLE POINTER
0077	05652	064140	LDB TSTPT	SAVE CURRENT POINTER
0078	05653	015467	JSB SLWST	TO TEMPORARY STACK
0079	05654	164165	LDB TEMPS+6,I	
0080	05655	015467	JSB SLWST	SAVE FUNCTION ADDRESS
0081	05656	063544	LDA FORMX	SAVE CURRENT
0082	05657	170142	STA HSTPT,I	FORMX RETURN ADDRESS
0083	05660	017544	JSB FORMX	EVALUATE THE PARAMETER
0084	05661	034157	ISZ TEMPS	UPDATE FORMULA POINTER
0085	05662	034157	ISZ TEMPS	PAST RIGHT PARENTHESIS
0086	05663	060157	LDA TEMPS	SWITCH
0087	05664	164141	LDB LSTPT,I	FORMULA POINTER
0088	05665	074157	STB TEMPS	TO FUNCTION'S
0089	05666	170141	STA LSTPT,I	FORMULA
0090	05667	064170	LDB TEMPS+9	SET
0091	05670	160142	LDA HSTPT,I	PARAMETER POINTER
0092	05671	034141	ISZ LSTPT	TO NEW PARAMETER,
0093	05672	034142	ISZ HSTPT	SAVING PREVIOUS
0094	05673	174141	STB LSTPT,I	SETTING ON
0095	05674	070170	STA TEMPS+9	LOW-CORE STACK
0096	05675	050140	CPA TSTPT	PROTECT PARAMETER IF
0097	05676	015536	JSB RSCHK	ON TEMPORARY STACK
0098	05677	017544	JSB FORMX	EVALUATE FUNCTION
0099	05700	160141	LDA LSTPT,I	RESTORE OLD
0100	05701	070170	STA TEMPS+9	PARAMETER POINTER
0101	05702	060141	LDA LSTPT	CUT BACK
0102	05703	040433	ADA M3	LOW-CORE
0103	05704	070141	STA LSTPT	STACK
0104	05705	002004	INA	RESTORE ORIGINAL
0105	05706	164000	LDB 0,I	TEMPORARY STACK
0106	05707	074140	STB TSTPT	POINTER
0107	05710	002004	INA	RESTORE
0108	05711	164000	LDB 0,I	ORIGINAL
0109	05712	074157	STB TEMPS	FORMULA POINTER
0110	05713	015505	JSB STTOP	POP RESULT

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0112**
0113** PRE-DEFINED FUNCTIONS RETURN HERE WITH RESULT
0114**
0115 05714 170140 FOR12 STA TSTPT,I STORE HIGH WORD
0116 05715 060140 LDA TSTPT
0117 05716 002004 INA STORE
0118 05717 174000 STB 0,I LOW WORD
0119 05720 034142 ISZ HSTPT
0120 05721 164142 LDB HSTPT,I RESTORE FORMX
0121 05722 077544 STB FORMX RETURN ADDRESS
0122 05723 040431 ADA M1 STACK ADDRESS
0123 05724 170142 STA HSTPT,I OF RESULT
0124 05725 027567 JMP FORM2
0125 05726 060165 FORM7 LDA TEMPS+6 COMPUTE
0126 05727 001727 ALF,ALF
0127 05730 001700 ALF FUNCTION
0128 05731 010344 AND .31
0129 05732 040305 ADA PDFBS ADDRESS
0130 05733 164000 LDB 0,I
0131 05734 015467 JSB SLWST SAVE FUNCTION ADDRESS
0132 05735 063544 LDA FORMX SAVE CURRENT
0133 05736 170142 STA HSTPT,I FORMX RETURN ADDRESS
0134 05737 017544 JSB FORMX EVALUATE THE PARAMETER
0135 05740 034157 ISZ TEMPS UPDATE FORMULA POINTER
0136 05741 034157 ISZ TEMPS PAST RIGHT PARENTHESIS
0137 05742 164141 LDB LSTPT,I POP
0138 05743 003400 CCA FUNCTION
0139 05744 040141 ADA LSTPT ENTRY
0140 05745 070141 STA LSTPT ADDRESS
0141 05746 077501 STB ESYMT SAVE
0142 05747 015505 JSB STTOP POP PARAMETER
0143 05750 127501 JMP ESYMT,I EVALUATE FUNCTION
0144 05751 160141 FORM9 LDA LSTPT,I UNSTACK
0145 05752 007400 CCB OPERATOR
0146 05753 044141 ADB LSTPT INFORMATION
0147 05754 074141 STB LSTPT WORD
0148 05755 001727 ALF,ALF COMPUTE
0149 05756 010374 AND B177 SUBROUTINE
0150 05757 040304 ADA ARBAS ADDRESS
0151 05760 124000 JMP 0,I EXECUTE
0152**
0153*** EXECUTION BRANCH TABLE **
0154**
0155 05761 006203 XECTB DEF ELET LET
0156 05762 006044 DEF XEC4 DIM
0157 05763 006044 DEF XEC4 COM
0158 05764 006044 DEF XEC4 DEF
0159 05765 006044 DEF XEC4 REM
0160 05766 006205 DEF EGOTO GO TO
0161 05767 006210 DEF EIF IF
0162 05770 006216 DEF EFOR FOR
0163 05771 006312 DEF ENEXT NEXT
0164 05772 006353 DEF EGOSB GOSUB
0165 05773 006364 DEF ERTRN RETURN
0166 05774 100205 DEF RDYDA,I END
0167 05775 100205 DEF RDYDA,I STOP

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0168	05776	006373	DEF EWAIT	WAIT
0169	05777	006412	DEF ECALL	CALL
0170	06000	006044	DEF XEC4	DATA
0171	06001	006441	DEF EREAD	READ
0172	06002	006474	DEF EPRIN	PRINT
0173	06003	006643	DEF EINPT	INPUT
0174	06004	006656	DEF ERSTR	RESTORE
0175	06005	011456	DEF EMAT	MAT
0176*				
0177*	*****	*****		
0178***		***		
0179***	EXECUTE THE PROGRAM	***		
0180***		***		
0181*	*****	*****		
0182*				
0183**				
0184***	INITIALIZE FOR CPUTPUT	**		
0185**				
0186	06006	002400	XEC CLA	SET COUNTER FOR
0187	06007	070146	STA TYPE	CHARACTERS OUTPUTTED
0188	06010	070155	STA XH	INITIALIZE
0189	06011	002004	INA	RANDOM
0190	06012	070156	STA XL	VARIABLE
0191**				
0192***	INITIALIZE THE DATA POINTER	**		
0193**				
0194	06013	003400	CCA	SET
0195	06014	070151	STA DCCNT	'NO'
0196	06015	070147	STA DSTRT	'DATA'
0197	06016	064112	LDB PBUFF	CONDITION
0198	06017	074150	STB NXTDT	
0199	06020	160315	LDA ADATA,I	SEARCH FOR FIRST
0200	06021	016105	JSB STSRH	DATA STATEMENT
0201	06022	026025	JMP XEC2	NONE FOUND
0202	06023	074147	STB DSTRT	SAVE STATEMENT LOCATION
0203	06024	016074	JSB SETDP	SET DATA POINTER
0204**				
0205***	INITIALIZE STACK POINTERS	**		
0206**				
0207	06025	064116	XEC2 LDB SYMTF	INITIALIZE
0208	06026	074142	STB HSTPT	POINTERS TO
0209	06027	064115	LDB FCORE	'HIGH CORE' STACK,
0210	06030	074140	STB TSTPT	'TEMPORARY'
0211	06031	044337	ADB .23	STACK, AND
0212	06032	074120	STB LSTAK	'LOW CORE'
0213	06033	074141	STB LSTPT	STACK
0214	06034	007000	CMB	DO
0215	06035	044142	ADB HSTPT	STACKS
0216	06036	006020	SSB	MEET?
0217	06037	025473	JMP E1	YES
0218	06040	064426	LDR RMODE	NO, SHIFT TO
0219	06041	074127	STB LISTR	RUN MODE
0220	06042	064112	LDB PBUFF	BEGIN
0221	06043	026054	JMP XEC5	EXECUTION

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0223**
0224*** FIND NEXT STATEMENT TO BE EXECUTED **
0225**
0226 06044 060144 XEC4 LDA NXTST NEXT STATEMENT NUMBER
0227 06045 064143 LDB PRADD PROSPECTIVE ADDRESS
0228 06046 150001 CPA 1,I DESIRED STATEMENT?
0229 06047 026055 JMP XEC6 YES
0230 06050 064112 LDB PBUFF NO, FIND
0231 06051 114213 JSB FNDPA,I STATEMENT
0232 06052 000000 NOP NON-EXISTENT
0233 06053 014477 JSB ERROR STATEMENT
0234 06054 160001 XEC5 LDA 1,I SAVE NEW
0235 06055 070145 XEC6 STA .LNUM SEQUENCE NUMBER
0236**
0237*** SET SUCCESSOR STATEMENT **
0238**
0239 06056 016147 JSB FLWST EXTRACT STATEMENT TYPE
0240 06057 010420 AND OPMSK POSITION
0241 06060 001727 ALF,ALF IT
0242 06061 001300 RAR COMPUTE EXECUTION ADDRESS
0243 06062 040303 ADA XECBR BRANCH TO EXECUTION CODE
0244 06063 124000 JMP 0,I
0245**
0246*** EVALUATE FORMLLA AND RETURN RESULT **
0247**
0248 06064 000000 FETCH NOP EVALUATE FORMULA
0249 06065 114233 JSB FORMA,I
0250 06066 015515 JSB OPCHK
0251 06067 034142 ISZ HSTPT UNSTACK RESULT ADDRESS
0252 06070 160001 LDA 1,I LOAD (A) WITH HIGH MANTISSA
0253 06071 006004 INB LOAD LOW PART
0254 06072 164001 LDB 1,I OF RESULT INTO (B)
0255 06073 126064 JMP FETCH,I EXIT
0256**
0257*** SET POINTER TO START OF DATA STATEMENT **
0258**
0259 06074 000000 SETDP NOP STATEMENT ADDRESS IN (B)
0260 06075 006004 INB LOAD
0261 06076 160001 LDA 1,I STATEMENT LENGTH
0262 06077 003004 CMA,INA SET
0263 06100 002004 INA DATA COUNTER
0264 06101 070151 STA DCCNT TO 1-STATEMENT LENGTH
0265 06102 006004 INB SET 'NEXT DATA' POINTER ONE
0266 06103 074150 STB NXTDT WORD ABOVE FIRST CONSTANT
0267 06104 126074 JMP SETDP,I
0268**
0269*** SEARCH FOR STATEMENT OF GIVEN TYPE **
0270**
0271 06105 000000 STSRH NOP TYPE IN (A), ADDRESS IN (B)
0272 06106 010420 AND OPMSK EXTRACT
0273 06107 070164 STA TEMP4 STATEMENT TYPE
0274 06110 060001 STSR1 LDA 1 EXTRACT
0275 06111 040325 ADA .2 PROGRAM
0276 06112 160000 LDA 0,I STATEMENT
0277 06113 010420 AND OPMSK TYPE
0278 06114 050164 CPA TEMP4 DESIRED TYPE?

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0279	06115	026124	JMP STSR2	YES
0280	06116	060001	LDA 1	NO, FETCH
0281	06117	002004	INA	STATEMENT LENGTH
0282	06120	144000	ADB 0,I	COMPUTE NEW ADDRESS
0283	06121	054113	CPB PBPTR	PAST LAST STATEMENT?
0284	06122	126105	JMP STSRH,I	YES
0285	06123	026110	JMP STSR1	NO
0286	06124	036105	STSR2 ISZ STSRH	
0287	06125	126105	JMP STSRH,I	

0288**

0289*** FETCH A DATA ITEM **

0290**

0291	06126	000000	FDATA NOP	
0292	06127	034151	FDAT1 ISZ DCCNT	MORE DATA?
0293	06130	026137	JMP FDAT2	YES
0294	06131	160315	LDA ADATA,I	NO, SEARCH
0295	06132	064150	LDB NXTDT	FOR NEXT
0296	06133	016105	J8B STSRH	DATA STATEMENT
0297	06134	014477	J8B ERROR	NONE FOUND
0298	06135	016074	E4 J8B SETDP	INITIALIZE THE
0299	06136	026127	JMP FDAT1	DATA POINTERS
0300	06137	034151	FDAT2 ISZ DCCNT	UPDATE
0301	06140	034151	ISZ DCCNT	POINTER
0302	06141	034150	ISZ NXTDT	
0303	06142	160150	LDA NXTDT,I	LOAD
0304	06143	034150	ISZ NXTDT	DATA
0305	06144	164150	LDB NXTDT,I	ITEM
0306	06145	034150	ISZ NXTDT	UPDATE POINTER
0307	06146	126126	JMP FDATA,I	

0308**

0309*** SET FOR FOLLOWING STATEMENT **

0310**

0311	06147	000000	FLWST NOP	(B) HOLDS PRESENT ADDRESS
0312	06150	060001	LDA 1	COMPUTE
0313	06151	002004	INA	ADDRESS
0314	06152	160000	LDA 0,I	OF
0315	06153	040001	ADA 1	NEXT
0316	06154	070143	STA PRADD	STATEMENT
0317	06155	160000	LDA 0,I	RECORD THE
0318	06156	070144	STA NXTST	SEQUENCE NUMBER
0319	06157	044325	ADB .2	FETCH
0320	06160	074157	STB TEMPS	FIRST WORD
0321	06161	160001	LDA 1,I	OF CURRENT
0322	06162	126147	JMP FLWST,I	STATEMENT

0323**

0324*** SEARCH STACK FOR GIVEN FOR-VARIABLE **

0325**

0326	06163	000000	FVSRH NOP	
0327	06164	160157	LDA TEMPS,I	FETCH
0328	06165	010401	AND MSK1	FOR-VARIABLE
0329	06166	071656	STA EDELM	SAVE FOR-VARIABLE
0330	06167	114231	J8B SSYMA,I	FIND ADDRESS IN
0331	06170	006004	INB	SYMBOL TABLE
0332	06171	060142	LDA HSTPT	SAVE
0333	06172	070163	STA TEMP3	STACK TOP
0334	06173	050116	FVSR1 CPA SYMTF	STACK BOTTOM?

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0335	06174	126163	JMP FVSRH,I	YES, EXIT VIA (P+1)
0336	06175	154000	CPB 0,I	MATCHING FOR-VARIABLE?
0337	06176	026201	JMP FVSR2	YES
0338	06177	040330	ADA .6	NO, MOVE TO
0339	06200	026173	JMP FVSR1	NEXT STACK ENTRY
0340	06201	036163	FVSR2 ISZ FVSRH	EXIT
0341	06202	126163	JMP FVSRH,I	VIA (P+2)
0342*				
0343***			***	
0344**	EXECUTE LET	**		
0345***			***	
0346*				
0347	06203	114233	ELET JSB FORMA,I	
0348	06204	026044	JMP XEC4	
0349*				
0350***			***	
0351**	EXECUTE GO TO	**		
0352***			***	
0353*				
0354	06205	006004	EGOTO INB	LOAD SEQUENCE
0355	06206	160001	LDA 1,I	NUMBER
0356	06207	026045	JMP XEC4+1	FIND REFERENCED STATEMENT
0357*				
0358***			***	
0359**	EXECUTE IF	**		
0360***			***	
0361*				
0362	06210	114232	EIF JSB FETCA,I	FETCH VALUE OF FORMULA
0363	06211	002003	SZA,RSS	RESULTANT TRUE?
0364	06212	026044	JMP XEC4	NO
0365	06213	034157	ISZ TEMPS	YES, BRANCH TO
0366	06214	064157	LDB TEMPS	FOLLOWING
0367	06215	026205	JMP EGOTO	SEQUENCE NUMBER
0368*				
0369***			***	
0370**	EXECUTE FOR	**		
0371***			***	
0372*				
0373	06216	016163	EFCR JSB FVSRH	FOR-VARIABLE ALREADY IN STACK?
0374	06217	026230	JMP EFOR1	NO
0375	06220	070162	STA TEMP2	YES, SAVE SOURCE ADDRESS
0376	06221	040330	ADA .6	SAVE
0377	06222	070164	STA TEMP4	DESTINATION ADDRESS
0378	06223	074161	STB TEMP1	SAVE FOR-VARIABLE ADDRESS
0379	06224	014554	JSB MVTOH	COMPRESS STACK
0380	06225	064161	LDB TEMP1	RESTORE FOR-VARIABLE ADDRESS
0381	06226	002400	CLA	COMPUTE
0382	06227	002401	CLA,RSS	COMPUTE
0383	06230	060436	EFCR1 LDA M6	NEW TOP OF
0384	06231	040142	ADA HSTPT	FOR-STACK
0385	06232	070142	STA HSTPT	POINTER
0386	06233	070161	STA TEMP1	
0387	06234	003004	CMA,INA	STACK
0388	06235	040141	ADA LSTPT	
0389	06236	002021	SSA,RSS	OVERFLOW?
0390	06237	025473	JMP E1	YES

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0341	0624H	174101	STB TEMP1,I	NO, RECORD FOR-VARIABLE ADDRESS
0392	00241	114233	JSB FORMA,I	INITIALIZE FOR-VARIABLE
0393	06242	034157	ISZ TEMPS	
0344	06243	W34101	ISZ TEMP1	SAVE
0395	06244	060101	LDA TEMP1	LIMIT
0396	06245	072340	STA ENEX2	ADDRESS
0397	06246	114232	JSB FETCA,I	FETCH
0398	06247	170101	STA TEMP1,I	AND
0399	06250H	034101	ISZ TEMP1	STORE
0400	06251	174101	STB TEMP1,I	LIMIT
0401	06252	034101	ISZ TEMP1	
0402	06253	064432	LDB M2	SET FOR STEP SIZE
0403	06254	076126	STB FDATA	SIGN CHECK
0404	06255	160157	LDA TEMPS,I	LOOK FOR
0405	06256	002002	SZA	FOLLOWING 'STEP'
0406	06257	026203	JMP EFOR2	FOUND
0407	06260	060466	LDA HONE	NOT FOUND,
0408	06261	064325	LDB .2	DEFAULT
0409	06262	002001	RSS	IS 1.0
0410	06263	114232	EFCR2 JSB FETCA,I	
0411	06264	002400	SSA	STEP SIZE NEGATIVE?
0412	06265	036126	ISZ FDATA	YES
0413	06266	174101	STA TEMP1,I	SAVE
0414	06267	034101	ISZ TEMP1	STEP
0415	06270	174101	STB TEMP1,I	SIZE
0416	06271	034101	ISZ TEMP1	SET POINTER
0417	06272	060144	LDA NXTST	TO STATEMENT
0418	06273	170101	STA TEMP1,I	FOLLOWING THE FOR
0419	06274	160314	EFCR3 LDA ANEXT,I	FIND
0420	06275	064143	LDB PRADD	'NEXT'
0421	06276	016105	JSB STSRH	STATEMENT
0422	06277	000400	NOP	
0423	06300	016147	JSB FLWST	FIND FOLLOWING STATEMENT
0424	06301	010401	AND MSK1	SAME
0425	06302	051656	CPA EDELM	FOR-VARIABLE?
0426	06303	002001	RSS	YES
0427	06304	026274	JMP EFOR3	NO
0428	06305	164142	LDB HSTPT,I	LOAD
0429	06306	160001	LDA 1,I	VALUE
0430	06307	0V6004	INB	OF
0431	06310	164001	LDB 1,I	FOR-VARIABLE
0432	06311	026337	JMP ENEX2-1	CHECK ACCEPTABILITY
0433*				
0434***			***	
0435**	EXECUTE NEXT	**		
0436***		***		
0437*				
0438	06312	016163	ENEXT JSB FVSRH	FIND CORRESPONDING STACK ENTRY
0439	06313	026044	JMP XEC4	NONE PRESENT
0440	06314	070142	STA HSTPT	RESET TOP OF STACK
0441	06315	076333	STB ENEX1	SAVE FOR-VARIABLE ADDRESS
0442	06316	002004	INA	SAVE LIMIT
0443	06317	072340	STA ENEX2	ADDRESS
0444	06320	040325	ADA .2	SAVE STEP SIZE
0445	06321	070161	STA TEMP1	ADDRESS
0446	06322	064432	LDB M2	SET STEP SIZE

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0447	06323	076126	STB FDATA	SIGN CHECK
0448	06324	160161	LDA TEMP1,I	LOAD
0449	06325	034161	ISZ TEMP1	STEP
0450	06326	164161	LDB TEMP1,I	SIZE
0451	06327	034161	ISZ TEMP1	
0452	06330	002020	SSA	CHECK
0453	06331	036126	ISZ FDATA	SIGN
0454	06332	017343	JSB .FAD	INCREMENT
0455	06333	000000	ENEX1 NOP	FOR-VARIABLE
0456	06334	172333	STA ENEX1,I	AND
0457	06335	036333	ISZ ENEX1	SAVE
0458	06336	176333	STB ENEX1,I	VALUE
0459	06337	017347	JSB .FSB	COMPUTE FOR-VARIABLE - LIMIT
0460	06340	000000	ENEX2 NOP	
0461	06341	036126	ISZ FDATA	POSITIVE STEP SIZE?
0462	06342	001600	ELA	YES, COMPLEMENT SIGN
0463	06343	002020	SSA	NO, NON-NEGATIVE RESULT?
0464	06344	026347	JMP ENEX3	NO
0465	06345	160161	LDA TEMP1,I	YES, GO TO FIRST
0466	06346	026045	JMP XEC4+1	STATEMENT OF LOOP
0467	06347	060142	ENEX3 LDA HSTPT	FAILS,
0468	06350	040330	ADA .6	ERASE
0469	06351	070142	STA HSTPT	STACK
0470	06352	026044	JMP XEC4	ENTRY
0471*				
0472***				***
0473**	EXECUTE GOSUB	**		
0474***				***
0475*				
0476	06353	006004	EGCSB INB	LOAD (A) WITH
0477	06354	160001	LDA 1,I	SEQUENCE NUMBER
0478	06355	064144	LDB NXTST	LOAD (B) WITH
0479	06356	070144	STA NXTST	RETURN SEQUENCE NUMBER
0480	06357	015467	JSB SLWST	STACK RETURN ON LOW-CORE STACK
0481	06360	040442	ADA M10	GOSUBS NESTED
0482	06361	050120	CPA LSTAK	10 DEEP?
0483	06362	014477	JSB ERROR	YES
0484	06363	026044	E2 JMP XEC4	NO
0485*				
0486***				***
0487**	EXECUTE RETURN	**		
0488***				***
0489*				
0490	06364	064141	ERTRN LDB LSTPT	RETURN STACK
0491	06365	054120	CPB LSTAK	EMPTY?
0492	06366	014477	JSB ERROR	YES
0493	06367	160141	E3 LDA LSTPT,I	NO, LOAD RETURN ADDRESS
0494	06370	044431	ADB M1	RESET
0495	06371	074141	STB LSTPT	STACK POINTER
0496	06372	026045	JMP XEC4+1	

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0498*				
0499***		***		
0500** EXECUTE WAIT **				
0501***		***		
0502*				
0503 06373 034157	EWAIT	ISZ TEMPS	POINT (TEMPS) TO FORMULA	
0504 06374 114232		JSB FETCA,I	FETCH EVALUATED FORMULA	
0505 06375 002020		SSA	NEGATIVE?	
0506 06376 026044		JMP XEC4	YES	
0507 06377 015364		JSB IFIX	CONVERT TO INTEGER	
0508 06400 002404		CLA,INA	LARGE INTEGER	
0509 06401 002003		SZA,RSS	SMALL	
0510 06402 007021		CMB,SSB,RSS	INTEGER?	
0511 06403 064470		LDB MNEG	NO	
0512 06404 006007	EWAI1	INB,SZB,RSS	WAIT?	
0513 06405 026044		JMP XEC4	NO	
0514 06406 060461		LDA M310	YES, SET INNER LOOP	
0515 06407 002006		INA,SZA	MORE?	
0516 06410 026407		JMP *-1	YES	
0517 06411 026404		JMP EWAI1	NO	
0518*				
0519***		***		
0520** EXECUTE CALL **				
0521***		***		
0522*				
0523 06412 034157	ECALL	ISZ TEMPS	FETCH	
0524 06413 034157		ISZ TEMPS	SUBROUTINE	
0525 06414 164157		LDB TEMPS,I	NUMBER	
0526 06415 015323		JSB FNDSB	FIND	
0527 06416 006004		INB	ENTRY	
0528 06417 164001		LDB 1,I	POINT AND	
0529 06420 074172		STB TEMPS+11	SAVE IT	
0530 06421 060142		LDA HSTPT	SAVE HIGH CORE	
0531 06422 070171		STA TEMPS+10	STACK POINTER	
0532 06423 034157	ECAL1	ISZ TEMPS	ANY	
0533 06424 160157		LDA TEMPS,I	PARAMETERS	
0534 06425 050406		CPA B4000	LEFT?	
0535 06426 026431		JMP ECAL2	NO	
0536 06427 114233		JSB FORMA,I	YES, EVALUATE	
0537 06430 026423		JMP ECAL1	A PARAMETER	
0538 06431 003400	ECAL2	CCA	LOAD ADDRESS OF	
0539 06432 040171		ADA TEMPS+10	PARAMETER ADDRESSES	
0540 06433 114172		JSB TEMPS+11,I	AND BRANCH TO SUBROUTINE	
0541 06434 060171		LDA TEMPS+10	RESTORE	
0542 06435 070142		STA HSTPT		
0543 06436 064115		LDB FCORE	POINTERS	
0544 06437 074140		STB TSTPT		
0545 06440 026044		JMP XEC4		

0547*				
0548***	***			
0549** EXECUTE READ	**			
0550***	***			
0551*				
0552 06441 054143	EREA	CPB PRADD	END-OF-STATEMENT?	
0553 06442 026044		JMP XEC4	YES	
0554 06443 114233		JSB FORMA,I	NO, EVALUATE NEXT ADDRESS	
0555 06444 160142		LDA HSTPT,I	RECORD	
0556 06445 071677		STA OUTLN	ADDRESS	
0557 06446 016126		JSB FDATA	GET DATA ITEM	
0558 06447 171677		STA OUTLN,I	STORE	
0559 06450 035677		ISZ OUTLN	DATA	
0560 06451 175677		STB OUTLN,I	ITEM	
0561 06452 034142		ISZ HSTPT		
0562 06453 064157		LDB TEMPS		
0563 06454 006004		INA		
0564 06455 026441		JMP EREAD		
0565**				
0566*** INITIALIZE FOR PRINT	***			
0567**				
0568 06456 000000	PRNIN	NOP		
0569 06457 003400		CCA	INITIALIZE	
0570 06460 040131		ADA .BUFA	BUFFER	
0571 06461 070132		STA BADDR	POINTER	
0572 06462 060146		LDA TYPE	INITIALIZE	
0573 06463 003004		CMA,INA	'CHARACTERS OUTPUTTED'	
0574 06464 070133		STA CCNT	COUNTER	
0575 06465 002011		SLA,RSS	START ON ODD CHARACTER POSITION?	
0576 06466 126456		JMP PRNIN,I	NO	
0577 06467 040431		ADA M1	YES, BIAS	
0578 06470 070133		STA CCNT	COUNTER	
0579 06471 002400		CLA	OUTPUT A	
0580 06472 015715		JSB OUTCR	NULL CHARACTER	
0581 06473 126456		JMP PRNIN,I		
0582*				
0583***	***			
0584** EXECUTE PRINT	**			
0585***	***			
0586*				
0587 06474 016456	EPRIN	JSB PRNIN	SET FOR PRINT	
0588 06475 002400		CLA	TURN ON	
0589 06476 026503		JMP EPRI1+1	'END-OF-LINE' FLAG	
0590 06477 002400	EPRI0	CLA	EXECUTE COMMA	
0591 06500 050567		CPL EOL	IF NOT FOLLOWING	
0592 06501 015656		JSB EDELM	A TAB	
0593 06502 003400	EPRI1	CCA	TURN OFF	
0594 06503 070567		STA EOL	'END-OF-LINE' FLAG	
0595 06504 160157		LDA TEMPS,I	EXTRACT	
0596 06505 010425		AND OPDMK	OPERAND	
0597 06506 002002		SZA	NULL?	
0598 06507 026527		JMP EPRI3	NO, FORMULA OR TAB	
0599 06510 034157	EPRI2	ISZ TEMPS	YES	
0600 06511 064157		LDB TEMPS	MORE	
0601 06512 054143		CPB PRADD	STATEMENT?	
0602 06513 026565		JMP EPRI7	NO	

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0603	06514	160157	LDA TEMPS,I	YES, EXTRACT
0604	06515	010420	AND OPMSK	NEXT OPERATOR
0605	06516	050403	CPLA B2000	' , ' ?
0606	06517	026477	JMP EPRI0	YES
0607	06520	050404	CPLA B3000	NO, ' ; ' ?
0608	06521	026502	JMP EPRI1	YES
0609	06522	050402	CPLA B1000	NO, " ?
0610	06523	026536	JMP EPRI4	YES
0611	06524	003400	CCA	NO, MUST BE +,-, OR (
0612	06525	040157	ADA TEMPS	BACKUP TO PRIOR
0613	06526	070157	STA TEMPS	NULL OPERAND
0614	06527	003400	CCA	SET
0615	06530	070567	STA EOL	TAB FLAG
0616	06531	114232	JSB FETCA,I	EVALUATE
0617	06532	034567	ISZ EOL	TAB?
0618	06533	026510	JMP EPRI2	YES
0619	06534	015643	JSB ENOUT	NO, PRINT NUMBER
0620	06535	026510	JMP EPRI2	
0621	06536	002400	EPR13 CLA	TURN ON
0622	06537	070567	STA EOL	'END-OF-LINE' FLAG
0623	06540	071467	STA SLWST	ZERO
0624	06541	071677	STA OUTLN	CHARACTER COUNT
0625	06542	160001	EPR15 LDA 1,I	
0626	06543	010376	AND MSK0	NON-NULL
0627	06544	002003	SZA,RSS	LOW CHARACTER?
0628	06545	026556	JMP EPR16	NO
0629	06546	035677	ISZ OUTLN	YES, COUNT IT
0630	06547	006004	INB	
0631	06550	160001	LDA 1,I	
0632	06551	010420	AND OPMSK	
0633	06552	050402	CPLA B1000	" NEXT?
0634	06553	026556	JMP EPR16	YES
0635	06554	035677	ISZ OUTLN	NO, COUNT HIGH CHARACTER
0636	06555	026542	JMP EPR15	
0637	06556	065677	EPR16 LDB OUTLN	WILL
0638	06557	044133	ADB CCNT	LINE
0639	06560	044455	ADB M73	EXCEED
0640	06561	006021	SSB,RSS	72 CHARACTERS?
0641	06562	015677	JSB OUTLN	YES, GET FRESH LINE
0642	06563	114223	JSB OUTSA,I	OUTPUT STRING
0643	06564	026504	JMP EPRI1+2	
0644	06565	034567	EPR17 ISZ EOL	'END-OF-LINE' ?
0645	06566	026603	JMP EPR18	YES
0646	06567	064146	LDB TYPE	NO, LOAD COUNT OF
0647	06570	007004	CMB,INB	CHARACTERS OUTPUTTED
0648	06571	060133	LDA CCNT	LOAD LINE LENGTH
0649	06572	003004	CMA,INA	SAVE NEW COUNT OF
0650	06573	070146	STA TYPE	CHARACTERS OUTPUTTED
0651	06574	040001	ADA I	COMPUTE CHARACTERS NOT YET OUT
0652	06575	004010	SLB	CORRECT FOR START ON
0653	06576	040431	ADA M1	ODD PRINT POSITION
0654	06577	064131	LDB .BUFA	OUTPUT
0655	06600	002002	SZA	NON-EMPTY
0656	06601	114102	JSB WRITE,I	BUFFER
0657	06602	026044	JMP XEC4	
0658	06603	015677	EPR18 JSB OUTLN	PRINT LINE

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0659	06604	026044	JMP XEC4		
0660**					
0661***	TAB TELEPRINTER	**			
0662**					
0663	06605	116631	ETAB	JSB IENTA,I	SMALL INTEGER?
0664	06606	026627		JMP ETAB1	NO
0665	06607	006400		CLB	YES, SET
0666	06610	074567		STB EOL	'TAB' FLAG TRUE
0667	06611	040454		ADA M72	EXCEED
0668	06612	002021		SSA,RSS	72?
0669	06613	026627		JMP ETAB1	YES
0670	06614	003004		CMA,INA	NO, COMPUTE
0671	06615	040454		ADA M72	BLANKS?
0672	06616	040133		ADA CCNT	REQUIRED
0673	06617	002021		SSA,RSS	ANY?
0674	06620	124264		JMP FR12A,I	NO
0675	06621	071677		STA OUTLN	YES,
0676	06622	060345		LDA .32	OUTPUT
0677	06623	015715		JSB OUTCR	REQUIRED
0678	06624	035677		ISZ OUTLN	NUMBER
0679	06625	026622		JMP *-3	OF BLANKS
0680	06626	124264		JMP FR12A,I	
0681	06627	015677	ETAB1	JSB OUTLN	OUTPUT THE
0682	06630	124264		JMP FR12A,I	LINE
0683*					
0684	06631	011413		IENTA DEF .IENT	
0685*					
0686***		***			
0687**	EXECUTE INPUT	**			
0688***		***			
0689*					
0690	06632	002006	EINP1	INA,SZA	END-OF-INPUT?
0691	06633	114206		JSB DRQSA,I	YES, CALL FOR MORE
0692	06634	014567	EINP2	JSB CONST	CONVERT AND STORE NUMBER
0693	06635	026632		JMP EINP1	NOT NUMBER
0694	06636	064157		LDB TEMPS	END-OF-
0695	06637	006004		INB	
0696	06640	054143		CPB PRAADD	STATEMENT?
0697	06641	026652		JMP EINP3	YES
0698	06642	050334		CPA .10	NO, INSURE MORE INPUT
0699	06643	114206	EINPT	JSB DRQSA,I	CALL FOR INPUT
0700	06644	114233		JSB FORMA,I	COMPUTE VARIABLE ADDRESS
0701	06645	003400		CCA	STORE
0702	06646	140142		ADA HSTPT,I	ADDRESS-1
0703	06647	034142		ISZ HSTPT	IN
0704	06650	070135		STA SBPTR	POINTER
0705	06651	026634		JMP EINP2	
0706	06652	002400	EINP3	CLA	RESET
0707	06653	070146		STA TYPE	OUTPUT BUFFER
0708	06654	026044		JMP XEC4	

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0710**
0711*** EXIT FORMULA CN EMPTY STACK **
0712**
0713 06655 105544 DEF FORMX,I
0714*
0715*** ***
0716** EXECUTE RESTORE **
0717*** ***
0718*
0719 06656 064147 ERSTR LDB DSTRT GET FIRST DATA STATEMENT ADDRESS
0720 06657 054431 CPB M1 IMPOSSIBLE ADDRESS?
0721 06660 026044 JMP XEC4 YES, DONE
0722 06661 016074 JSB SETDP NO, SET DATA POINTER
0723 06662 026044 JMP XEC4 DONE
0001**
0002*** FORMULA OPERATOR JUMP TABLE **
0003**
0004 06663 006722 ARCTB DEF ESCMA SUBSCRIPT SEPARATOR
0005 06664 007002 DEF ESTR ASSIGNMENT OPERATOR
0006 06665 007026 DEF EFAD '+'
0007 06666 007031 DEF EFSB '-'
0008 06667 007034 DEF EFMP '*'
0009 06670 007037 DEF EFDV '/'
0010 06671 007042 DEF EPWR '||'
0011 06672 007164 DEF EQTRT '>'
0012 06673 007171 DEF ELST '<'
0013 06674 007215 DEF ENEQL '#'
0014 06675 007176 DEF EEQL '='
0015 06676 007227 DEF EUMIN UNARY '-'
0016 06677 007232 DEF ELBRC '['
0017 06700 100260 DEF FOR1A,I '('
0018 06701 100262 DEF FOR0B,I UNARY '+'
0019 06702 007240 DEF EOR OR
0020 06703 007246 DEF EAND AND
0021 06704 007253 DEF ENOT NOT
0022 06705 007203 DEF EGORE '>='
0023 06706 007210 DEF ELORE '<='
0024**
0025*** EXECUTE A BINARY OPERATOR **
0026**
0027 06707 000000 BINOP NOP SAVE
0028 06710 162707 LDA BINOP,I SUBROUTINE
0029 06711 072717 STA BIN01 CALL
0030 06712 036707 ISZ BINOP SET RETURN ADDRESS
0031 06713 015515 JSB OPCHK SAVE ADDRESS OF
0032 06714 076720 STB BIN02 TOP OPERAND
0033 06715 034142 ISZ HSTPT UNSTACK ADDRESS
0034 06716 015505 JSB STTOP LOAD SECOND OPERAND
0035 06717 000000 BIN01 NOP PERFORM OPERATION
0036 06720 000000 BIN02 NOP ADDRESS OF SECOND OPERAND
0037 06721 126707 JMP BINOP,I

0039**

0040*** EXECUTE SUBSCRIPT COMMA **

0041**

0042	06722	016771	ESCM1	JSB E8BS	INTEGERIZE COLUMN SUBSCRIPT
0043	06723	034141		ISZ LSTPT	
0044	06724	016771		JSB ESBS	INTEGERIZE ROW SUBSCRIPT
0045	06725	164142		LDB HSTPT,I	FETCH
0046	06726	044325		ADB .2	SUBSCRIPT
0047	06727	160001		LDA 1,I	ROUNDS
0048	06730	010376		AND MSK0	SAVE
0049	06731	071677		STA OUTLN	COLUMN BOUND
0050	06732	160001		LDA 1,I	EXTRACT
0051	06733	001727		ALF,ALF	ROW
0052	06734	010376		AND MSK0	BOUND
0053	06735	003004		CMA,INA	ACTUAL
0054	06736	140141		ADA LSTPT,I	ROW SUBSCRIPT
0055	06737	002021		SSA,RSS	LEGAL?
0056	06740	026757		JMP E6-1	NO
0057	06741	061677		LDA OUTLN	YES
0058	06742	050324		CPA .1	COLUMN MATRIX?
0059	06743	026747		JMP ESCM1	YES
0060	06744	015236		JSB MPY	NO, COMPUTE ADDRESS
0061	06745	100141		DEF LSTPT,I	DISPLACEMENT
0062	06746	002001		RSS	DUE TO ROWS
0063	06747	160141	ESCM1	LDA LSTPT,I	
0064	06750	007400		CCB	UNSTACK
0065	06751	044141		ADB LSTPT	ROW
0066	06752	074141		STB LSTPT	SUBSCRIPT
0067	06753	065677		LDB OUTLN	ACTUAL
0068	06754	007004		CMB,INB	COLUMN
0069	06755	144141		ADB LSTPT,I	SUBSCRIPT
0070	06756	006021		SSB,RSS	LEGAL?
0071	06757	014477		JSB ERROR	NO
0072	06760	140141	E6	ADA LSTPT,I	YES, ADD IN COLUMN DISPLACEMENT
0073	06761	001000		ALS	DOUBLE DISPLACEMENT
0074	06762	164142		LDB HSTPT,I	COMPUTE
0075	06763	140001		ADA 1,I	ACTUAL
0076	06764	170142		STA HSTPT,I	ADDRESS
0077	06765	064141		LDB LSTPT	UNSTACK
0078	06766	044431		ADB M1	
0079	06767	074141		STB LSTPT	(
0080	06770	124260		JMP FOR1A,I	

0081**

0082*** INTEGERIZE A SUBSCRIPT **

0083**

0084	06771	000000	ESBS	NOP	
0085	06772	015515		JSB OPCHK	VALIDATE SUBSCRIPT
0086	06773	160001		LDA 1,I	FETCH
0087	06774	006004		INB	SUBSCRIPT
0088	06775	164001		LDB 1,I	
0089	06776	015353		JSB SBFIX	INTEGERIZE
0090	06777	174141		STB LSTPT,I	SAVE IN OPERATOR STACK
0091	07000	034142		ISZ HSTPT	POP OPERAND STACK
0092	07001	126771		JMP ESBS,I	

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0094**
0095*** EXECUTE STORE **
0096**
0097 07002 064166 ESTR LDB TEMPS+7 IS NEXT OPERATOR
0098 07003 006002 SZB AN END-OF-FORMULA?
0099 07004 124263 JMP FOR1B,I NO, DEFER STORE
0100 07005 054165 CPB TEMPS+6 YES, FIRST STORE OPERATOR USED?
0101 07006 027022 JMP ESTR2 YES
0102 07007 160142 ESTR1 LDA HSTPT,I SET
0103 07010 070170 STA TEMPS+9 DESTINATION
0104 07011 060165 LDA TEMPS+6 SOURCE ADDRESS IN (A)
0105 07012 164000 LDB 0,I TRANSFER HIGH
0106 07013 174170 STB TEMPS+9,I PART OF SOURCE
0107 07014 034170 ISZ TEMPS+9 UPDATE
0108 07015 002004 INA POINTERS
0109 07016 164000 LDB 0,I TRANSFER LOW
0110 07017 174170 STB TEMPS+9,I PART OF SOURCE
0111 07020 034142 ISZ HSTPT POP STACK
0112 07021 124262 JMP FOR0B,I
0113 07022 015515 ESTR2 JSB OPCHK SAVE ADDRESS
0114 07023 074165 STB TEMPS+6 OF QUANTITY
0115 07024 034142 ISZ HSTPT YES, POP HIGH-CORE
0116 07025 027007 JMP ESTR1 STACK AND EXECUTE STORE
0117**
0118*** CALL ADD **
0119**
0120 07026 016707 EFAD JSB BINOP
0121 07027 017343 JSB .FAD
0122 07030 124261 JMP FOR0A,I
0123**
0124*** CALL SUBTRACT **
0125**
0126 07031 016707 EFSD JSB BINOP
0127 07032 017347 JSB .FSB
0128 07033 124261 JMP FOR0A,I
0129**
0130*** CALL MULTIPLY **
0131**
0132 07034 016707 EFMP JSB BINOP
0133 07035 017416 JSB .FMP
0134 07036 124261 JMP FOR0A,I
0135**
0136*** CALL DIVIDE **
0137**
0138 07037 016707 EFIV JSB BINOP
0139 07040 017463 JSB .FDV
0140 07041 124261 JMP FOR0A,I
0141**
0142*** EXECUTE ? **
0143**
0144 07042 164142 EPWR LDB HSTPT,I LOAD
0145 07043 160001 LDA 1,I
0146 07044 006004 INB POWER
0147 07045 164001 LDB 1,I
0148 07046 015364 JSB IFIX
0149 07047 027052 JMP *+3

0150	07050	102301	SOS	INTEGER?
0151	07051	027065	JMP EPWR1	YES
0152	07052	016707	JSB BINOP	NO
0153	07053	027054	JMP RPWR	
0154	07054	017144	RPHR JSB PCHK	CHECK ARGUMENTS
0155	07055	002020	SSA	NEGATIVE BASE?
0156	07056	014477	JSB ERROR	YES
0157	07057		BASER EQU *	
0158	07057	066717	LDB BIN01	NO, LOAD BASE
0159	07060	114234	JSB .LOGA,I	TAKE NATURAL LOG
0160	07061	017416	JSB .FMP	MULTIPLY
0161	07062	106720	DEF BIN02,I	BY POWER
0162	07063	114235	JSB .EXPA,I	EXPONENTIATE
0163	07064	124261	JMP FOR0A,I	RESULT
0164	07065	077463	EPWR1 STB TT1	SAVE SIGN
0165	07066	006020	SSB	SAVE
0166	07067	007004	CMB,INB	ABSOLUTE VALUE
0167	07070	077552	STB TT2	OF POWER
0168	07071	016707	JSB BINOP	
0169	07072	027073	JMP IPWR	
0170	07073	017144	IPHR JSB PCHK	CHECK ARGUMENTS
0171	07074	066717	LDB BIN01	STORE
0172	07075	072717	STA BIN01	
0173	07076	076720	STB BIN02	
0174	07077	060466	LDA HONE	BASE
0175	07100	070163	STA TT3	INITIALIZE
0176	07101	060325	LDA .2	RESULT
0177	07102	070164	STA TT4	TO
0178	07103	067552	IPWR1 LDB TT2	1.0
0179	07104	004031	SLB,BRS	DIVIDE POWER
0180	07105	027124	JMP IPWR3	BY 2
0181	07106	077552	STB TT2	WAS ODD
0182	07107	006002	IPWR2 SZB	WAS EVEN
0183	07110	027135	JMP IPWR4	ZERO?
0184	07111	063463	LDA TT1	NO
0185	07112	002020	SSA	YES
0186	07113	027117	JMP IPWR5	POSITIVE POWER?
0187	07114	060163	LDA TT3	NO
0188	07115	064164	LDB TT4	YES, LOAD
0189	07116	124261	JMP FOR0A,I	RESULT
0190	07117	060466	IPWR5 LDA HONE	LOAD
0191	07120	064325	LDB .2	1.0
0192	07121	017463	JSB .FDV	DIVIDE BY
0193	07122	000163	DEF TT3	RESULT
0194	07123	124261	JMP FOR0A,I	
0195	07124	077552	IPWR3 STB TT2	SAVE POWER
0196	07125	062717	LDA BIN01	LOAD
0197	07126	066720	LDB BIN02	BASE
0198	07127	017416	JSB .FMP	MULTIPLY BY
0199	07130	000163	DEF TT3	RESULT-SO-FAR
0200	07131	070163	STA TT3	SAVE PARTIAL
0201	07132	074164	STB TT4	RESULT
0202	07133	067552	LDB TT2	LOAD POWER
0203	07134	027107	JMP IPWR2	
0204	07135	062717	IPWR4 LDA BIN01	LOAD
0205	07136	066720	LDB BIN02	BASE

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0206	07137	017416	JSB .FMP	SQUARE
0207	07140	006717	DEF BIN01	IT
0208	07141	072717	STA BIN01	SAVE
0209	07142	076720	STB BIN02	RESULT
0210	07143	027103	JMP IPWR1	
0211**				
0212*** INSURE VALID OPERATION **				
0213**				
0214	07144	000000	PCFK NOP	
0215	07145	076717	STB BIN01	LOAD
0216	07146	166720	LDB BIN02,I	POWER
0217	07147	002002	SZA	BASE ZERO?
0218	07150	027161	JMP PCHK1	NO
0219	07151	006003	SZB,RSS	YES, POWER ZERO?
0220	07152	014477	JSB ERROR	YES
0221	07153		POWER EQU *	
0222	07153	006021	SSB,RSS	NO, POWER POSITIVE?
0223	07154	027221	JMP FALSE	YES
0224	07155	014477	JSB ERROR	NO
0225	07156	060422	ZRTNG LDA INF	USE POSITIVE
0226	07157	064432	LDB M2	INFINITY
0227	07160	124261	JMP FORA,I	
0228	07161	006003	PCFK1 SZB,RSS	POWER ZERO?
0229	07162	027224	JMP TRUE	YES, RETURN 1.0
0230	07163	127144	JMP PCHK,I	NO
0231**				
0232*** EXECUTE > **				
0233**				
0234	07164	016707	EGTRT JSB BINOP	COMPUTE OPERAND
0235	07165	017347	JSB .FSB	DIFFERENCE
0236	07166	002020	SSA	NEGATIVE?
0237	07167	027221	JMP FALSE	YES
0238	07170	027217	JMP ENEQ1	NO
0239**				
0240*** EXECUTE < **				
0241**				
0242	07171	016707	ELST JSB BINOP	COMPUTE OPERAND
0243	07172	017347	JSB .FSB	DIFFERENCE
0244	07173	002020	SSA	NEGATIVE?
0245	07174	027224	JMP TRUE	YES
0246	07175	027221	JMP FALSE	NO
0247**				
0248*** EXECUTE = **				
0249**				
0250	07176	016707	EEQL JSB BINOP	COMPUTE OPERAND
0251	07177	017347	JSB .FSB	DIFFERENCE
0252	07200	002002	EEOGL1 SZA	ZERO?
0253	07201	027221	JMP FALSE	NO
0254	07202	027224	JMP TRUE	YES

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0256**
0257*** EXECUTE >= **
0258**
0259 07203 016707 EGCRE JSB BINOP COMPUTE OPERAND
0260 07204 017347 JSB .FSB DIFFERENCE
0261 07205 002020 SSA POSITIVE?
0262 07206 027221 JMP FALSE NO
0263 07207 027224 JMP TRUE YES

0264**
0265*** EXECUTE <= **
0266**
0267 07210 016707 ELCRE JSB BINOP COMPUTE OPERAND
0268 07211 017347 JSB .FSB DIFFERENCE
0269 07212 002020 SSA NEGATIVE?
0270 07213 027224 JMP TRUE YES
0271 07214 027200 JMP EEQL1 NO

0272**
0273*** EXECUTE # **
0274**
0275 07215 016707 ENEQL JSB BINOP COMPUTE OPERAND
0276 07216 017347 JSB .FSB DIFFERENCE
0277 07217 002002 ENEW1 SZA NON-ZERO?
0278 07220 027224 JMP TRUE YES

0279**
0280*** SET LOGICAL VALUES **
0281**
0282 07221 002400 FALSE CLA LOAD
0283 07222 006400 CLB ZERO
0284 07223 124261 JMP FOR0A,I
0285 07224 060466 TRLE LDA HONE LOAD
0286 07225 064325 LDB .2 ONE
0287 07226 124261 JMP FOR0A,I

0288**
0289*** EXECUTE UNARY - **
0290**
0291 07227 015505 EUMIN JSB STTOP LOAD NUMBER
0292 07230 015423 JSB ARINV NEGATE NUMBER
0293 07231 124261 JMP FOR0A,I

0294**
0295*** EXECUTE LEFT BRACKET **
0296**
0297 07232 034141 ELBRC ISZ LSTPT LOAD SUBSCRIPT COMMA
0298 07233 064405 LDB SCCNT INFORMATION WORD
0299 07234 015467 JSB SLWST STACK IT
0300 07235 015476 JSB BHSTP STACK
0301 07236 015536 JSB RSCHK
0302 07237 027224 JMP TRUE 1

0303**
0304*** EXECUTE OR **
0305**
0306 07240 016707 EOR JSB BINOP VALIDATE
0307 07241 027242 JMP ORS OPERANDS
0308 07242 002002 ORS SZA SECOND OPERAND NON-ZERO?
0309 07243 027224 JMP TRUE YES
0310 07244 162720 ORS1 LDA BIN02,I NO, CHECK SECOND
0311 07245 027217 JMP ENEQ1 OPERAND

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0312**
0313*** EXECUTE AND **
0314**
0315 07246 016707 EAND JSB BINOP VALIDATE
0316 07247 027250 JMP ANDS OPERANDS
0317 07250 002003 ANIS SZA,RSS SECOND OPERAND ZERO?
0318 07251 027221 JMP FALSE YES
0319 07252 027244 JMP ORS1 NO

0320**
0321*** EXECUTE NOT **
0322**
0323 07253 015505 ENCT JSB STTOP LOAD OPERAND
0324 07254 002002 SZA ZERO?
0325 07255 027221 JMP FALSE NO
0326 07256 027224 JMP TRUE YES

0327**
0328*** ADD TWO FLOATING POINT QUANTITIES **
0329**
0330 07257 000000 ADMUP NOP
0331 07260 061677 LDA OUTLN COMPUTE
0332 07261 003004 ADMU1 CMA,INA EXPONENT
0333 07262 040154 ADA EXP DIFFERENCE
0334 07263 002021 SSA,RSS ARG 1 LARGER?
0335 07264 027302 JMP ADMU2 YES
0336 07265 062074 LDA A1 NO,
0337 07266 066105 LDB A2 SWAP
0338 07267 072105 STA A2 ARGUMENTS
0339 07270 076074 STB A1
0340 07271 062147 LDA C1
0341 07272 066163 LDB C2
0342 07273 072163 STA C2
0343 07274 076147 STB C1
0344 07275 060154 LDA EXP
0345 07276 065677 LDB OUTLN
0346 07277 071677 STA OUTLN
0347 07300 074154 STB EXP
0348 07301 027261 JMP ADMU1
0349 07302 040447 ADMU2 ADA M25 SHIFT COUNT >=
0350 07303 066147 LDB C1 25 ?
0351 07304 002021 SSA,RSS YES, IGNORE SMALLER ARGUMENT
0352 07305 027334 JMP ADMU4 NO, COMPUTE
0353 07306 003100 CMA,CLE SHIFT COUNT
0354 07307 040447 ADA M25 AS NEGATIVE
0355 07310 071677 STA OUTLN LOAD SMALLER
0356 07311 062105 LDA A2 MANTISSA
0357 07312 066163 LDB C2 MORE SHIFTS?
0358 07313 035677 ADMU3 ISZ OUTLN YES
0359 07314 027337 JMP ADMU5 NO, ADD LOW MANTISSAS
0360 07315 046147 ADB C1
0361 07316 103101 CLO
0362 07317 005326 RBR,ELB SAVE (E) IN B(0)
0363 07320 000040 CLE
0364 07321 042074 ADA A1 ADD HIGH MANTISSAS
0365 07322 004010 SLB OVERFLOW FROM LOWER MANTISSA?
0366 07323 002004 INA YES, ADD IT IN
0367 07324 005566 ERB,CLE,ELB ERASE B(0)

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0368	07325	102301	SOS	OVERFLOW?
0369	07326	027335	JMP ADMU4+1	NO
0370	07327	001500	ERA	YES, SHIFT
0371	07330	005500	ERB	MANTISSA DOWN AND
0372	07331	034154	ISZ EXP	CORRECT EXPONENT
0373	07332	027335	JMP ADMU4+1	
0374	07333	002001	RSS	
0375	07334	062074	ADMU4 LDA A1	RETRIEVE HIGH MANTISSA
0376	07335	015020	JSB .PACK	NORMALIZE AND PACK
0377	07336	127257	JMP ADMUP, I	
0378	07337	000071	ADMUS CLE,SLA,ARS	ARITHMETIC
0379	07340	002200	CME	DOUBLE
0380	07341	005540	ERB,CLE	SHIFT
0381	07342	027313	JNP ADMU3	
0382**				
0383***				ADD TWO FLOATING POINT NUMBERS **
0384**				
0385	07343	000000	.FAD NOP	
0386	07344	017366	JSB UNPAK	UNPACK THE ARGUMENTS
0387	07345	017257	JSB ADMUP	ADD THEM UP
0388	07346	127343	JNP .FAD, I	
0389**				
0390***				SUBTRACT TWO FLOATING POINT NUMBERS **
0391**				
0392	07347	000000	.FSB NOP	
0393	07350	017366	JSB UNPAK	UNPACK THE ARGUMENTS
0394	07351	062105	LDA A2	TWO'S COMPLEMENT
0395	07352	003000	CMA	THE SECOND ARGUMENT
0396	07353	007006	CMB,INB,8ZB	LOW PART ZERO?
0397	07354	027362	JMP .FSB1	NO
0398	07355	002025	SSA,INA,RSS	YES, ORIGINAL NUMBER NEGATIVE?
0399	07356	002021	SSA,RSS	YES, STILL NEGATIVE?
0400	07357	027362	JMP .FSB1	NO
0401	07360	001300	RAR	YES, SHIFT DOWN AND
0402	07361	035677	ISZ OUTLN	CORRECT EXPONENT
0403	07362	076163	.FSB1 STB C2	SAVE COMPLEMENTED
0404	07363	072105	STA A2	NUMBER
0405	07364	017257	JSB ADMUP	ADD ARGUMENTS
0406	07365	127347	JNP .FSB, I	
0407**				
0408***				UNPACK ARGUMENTS FOR ARITHMETIC OPERATIONS **
0409**				
0410	07366	000000	UNPAK NOP	
0411	07367	072074	STA A1	SAVE HIGH PART OF ARG 1
0412	07370	002003	SZA,RSS	UNPACK
0413	07371	006404	CLB,INB	SECOND
0414	07372	015456	JSB .FLUN	WORD
0415	07373	076147	STB C1	SAVE LOW PART OF ARG 1
0416	07374	070154	STA EXP	SAVE EXPONENT OF ARG 1
0417	07375	063366	LDA UNPAK	COMPUTE ADDRESS OF
0418	07376	040432	ABA M2	CALLING ROUTINE
0419	07377	164000	LDB 0,I	
0420	07400	134000	ISZ 0,I	SET CALLING ROUTINE'S RETURN
0421	07401	164001	LDB 1,I	LOAD
0422	07402	005275	RBL,CLE,SLB,ERB	ADDRESS OF
0423	07403	027401	JMP *-2	ARG 2

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0424	07404	160001	LDA 1,I	LOAD
0425	07405	006004	INB	ARG 2
0426	07406	164001	LDB 1,I	
0427	07407	072105	STA A2	SAVE HIGH PART OF ARG 2
0428	07410	002003	SZA,RSS	UNPACK
0429	07411	006404	CLB,INB	SECOND
0430	07412	015456	JSB .FLUN	WORD
0431	07413	076163	STB C2	SAVE LOW PART OF ARG 2
0432	07414	071677	STA OUTLN	SAVE EXPONENT OF ARG 2
0433	07415	127366	JMP UNPAK,I	
0434**				
0435***		MULTIPLY TWO FLOATING POINT NUMBERS **		
0436***				
0437	07416	000000	.FMP NOP	UNPACK THE
0438	07417	017366	JSB UNPAK	ARGUMENTS
0439	07420	040154	ADA EXP	ADD EXPONENTS
0440	07421	002004	INA	PLUS 1 FOR
0441	07422	070154	STA EXP	NORMALIZATION
0442	07423	005300	RBR	POSITION LOW PART OF ARG 2
0443	07424	060001	LDA 1	COMPUTE A
0444	07425	015236	JSB MPY	CROSS PRODUCT
0445	07426	006074	DEF A1	
0446	07427	072163	STA C2	SAVE RESULT
0447	07430	062147	LDA C1	LOAD AND POSITION
0448	07431	001300	RAR	LOW PART OF ARG 1
0449	07432	076147	STB C1	SAVE REST OF PRIOR RESULT
0450	07433	015236	JSB MPY	COMPUTE SECOND
0451	07434	006105	DEF A2	CROSS PRODUCT
0452	07435	046147	ADB C1	ADD
0453	07436	000040	CLE	CROSS
0454	07437	042163	ADA C2	PRODUCTS
0455	07440	002040	SEZ	CORRECT
0456	07441	006004	INB	FOR CARRY
0457	07442	076163	STB C2	SAVE RESULT
0458	07443	062074	LDA A1	COMPUTE
0459	07444	015236	JSB MPY	HIGH PART
0460	07445	006105	DEF A2	OF PRODUCT
0461	07446	000065	CLE,ERA	POSITION LOW PART
0462	07447	042163	ADA C2	ADD IN CROSS TERMS
0463	07450	000066	CLE,ELA	REPOSITION
0464	07451	002041	SEZ,RSS	CARRY FROM LOW PART?
0465	07452	027456	JMP **4	NO
0466	07453	102201	SOC	YES, POSITIVE CARRY?
0467	07454	006005	INB,RSS	YES
0468	07455	044431	ADB M1	NO
0469	07456	072074	STA A1	EXCHANGE
0470	07457	060001	LDA 1	
0471	07460	066074	LDB A1	REGISTERS
0472	07461	015020	JSB .PACK	NORMALIZE AND PACK
0473	07462	127416	JMP .FMP,I	

0475**
 0476*** PERFORM FLOATING DIVIDE **
 0477**
 0478 07463 000000 .FIV NOP
 0479 07464 017366 JSB UNPAK UNPACK ARGUMENTS
 0480 07465 066105 LDB A2 DIVISOR
 0481 07466 006003 SZB,RSS ZERO?
 0482 07467 027546 JMP .FDV2 YES
 0483 07470 066074 LDB A1 NO, DIVIDEND
 0484 07471 006003 SZB,RSS ZERO?
 0485 07472 027543 JMP .FDV1 YES
 0486 07473 003004 CMA,INA NO, COMPUTE
 0487 07474 002004 INA EXPONENT
 0488 07475 040154 ADA EXP DIFFERENCE
 0489 07476 070154 STA EXP PLUS 1
 0490 07477 062147 LDA C1 LOAD DIVIDEND
 0491 07500 004071 CLE,SLB,BRS ARITHMETIC
 0492 07501 002200 CME RIGHT SHIFT
 0493 07502 001500 ERA TWICE TO
 0494 07503 004071 CLE,SLB,BRS PREVENT
 0495 07504 002200 CME DIVISION
 0496 07505 001500 ERA OVERFLOW
 0497 07506 017552 JSB IDIV DIVIDE
 0498 07507 071677 STA OUTLN SAVE QUOTIENT
 0499 07510 005100 BRS DIVIDE REMAINDER BY 2 TO
 0500 07511 002400 CLA PREVENT DIVISION OVERFLOW
 0501 07512 017552 JSB IDIV DIVIDE REMAINDER AND
 0502 07513 070615 STA NUMCK SAVE LOW PART OF QUOTIENT
 0503 07514 066163 LDB C2
 0504 07515 002500 CLA,CLE SCALE TO
 0505 07516 005521 ERB,BRS PREVENT
 0506 07517 005100 BRS OVERFLOW
 0507 07520 017552 JSB IDIV COMPUTE $B_2/A_2 = Q$
 0508 07521 003004 CMA,INA COMPUTE
 0509 07522 015236 JSB MPY -HIGH QUOTIENT*Q
 0510 07523 001677 DEF OUTLN
 0511 07524 005066 BLS,CLE,ELB SHIFT SIGN TO (E)
 0512 07525 060615 LDA NUMCK LOW QUOTIENT
 0513 07526 002020 SSA NEGATIVE?
 0514 07527 003401 CCA,RSS YES, SET (A)=-1 (EXTEND
 0515 07530 002400 CLA NO, SET (A)=0 SIGN)
 0516 07531 003040 CMA,SEZ IF (E)=1 SUBTRACT
 0517 07532 002004 INA 1 AS EXTENSION
 0518 07533 003100 CMA,CLE OF PRODUCT
 0519 07534 044615 ADB NUMCK ADD IN LOW QUOTIENT
 0520 07535 002040 SEZ CARRY
 0521 07536 002004 INA INTO (A)
 0522 07537 004066 CLE,ELB POSITION
 0523 07540 001600 ELA REGISTERS
 0524 07541 041677 ADA OUTLN ADD IN HIGH QUOTIENT
 0525 07542 002001 RSS
 0526 07543 002400 .FIV1 CLA SET MANTISSA TO ZERO
 0527 07544 015020 JSB .PACK NORMALIZE AND PACK
 0528 07545 127463 JMP .FDV,I
 0529 07546 014477 .FIV2 JSB ERROR DIVIDE-BY-ZERO
 0530 07547 062074 DBYZR LDA A1

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0531	07550	015103	JBB OVFLW	RETURN INFINITY
0532	07551	127463	JMP .FDV,I	
0533**				
0534***	INTEGER DIVIDE **			
0535**				
0536	07552	000000	IDIV	NOP
0537	07553	076074		STB A1
0538	07554	066105		LDB A2
0539	07555	006120		CLE,SSB
0540	07556	007204		CMB,CME,INB
0541	07557	077343		STB .FAD
0542	07560	007004		CMB,INB
0543	07561	077347		STB .FSB
0544	07562	064445		LDB M16
0545	07563	076147		STB C1
0546	07564	064432		LDB M2
0547	07565	074153		STB SIGN
0548	07566	077416		STB .FMP
0549	07567	066074		LDB A1
0550	07570	006021		SSB,RSS
0551	07571	027577		JMP IDIV1
0552	07572	037416		ISZ .FMP
0553	07573	007200		CMB,CME
0554	07574	002002		SZA
0555	07575	003005		CMA,INA,RSS
0556	07576	006004		INB
0557	07577	002040	IDIV1	SEZ
0558	07600	034153		ISZ SIGN
0559	07601	000066	IDIV2	CLE,ELA
0560	07602	005600		ELB
0561	07603	047347		ADB .FSB
0562	07604	006021		SSB,RSS
0563	07605	002005		INA,RSS
0564	07606	047343		ADB .FAD
0565	07607	036147		ISZ C1
0566	07610	027601		JMP IDIV2
0567	07611	003004		CMA,INA
0568	07612	034153		ISZ SIGN
0569	07613	003004		CMA,INA
0570	07614	037416		ISZ .FMP
0571	07615	127552		JMP IDIV,I
0572	07616	007004		CMB,INB
0573	07617	127552		JMP IDIV,I

```

0575* ***** SYMBOL TABLE SEARCH SUBROUTINE *****
0576* ***** SYMBOL TABLE SEARCH SUBROUTINE *****
0577* ***** SYMBOL TABLE SEARCH SUBROUTINE *****
0578* ***** SYMBOL TABLE SEARCH SUBROUTINE *****
0579* THE SUBROUTINE IS CALLED WITH THE IDENTIFIER TO BE
0580* SEARCHED FOR IN A . THE SUBROUTINE RETURNS WITH
0581* THE ADDRESS OF THE MATCHING ENTRY IN B OR -1 IN
0582* B IF THERE IS NO MATCHING ENTRY
0583* THE FOLLOWING RULES APPLY WHEN SEARCHING FOR ARRAYS
0584*
0585* TYPE 1 (1 DIMENSION) SEARCH FOR CORRESPONDING TYPE 1
0586* OR TYPE 3 ARRAY. IF TYPE 3 IS FOUND CHANGE THE ENTRY
0587* TYPE TO TYPE 1
0588*
0589* TYPE 2 (2 DIMENSIONS) SEARCH FOR CORRESPONDING TYPES
0590* OR TYPE 3 ARRAY. IF TYPE 3 IS FORND CHANGE THE ENTRY
0591* TYPE TO TYPE 2
0592*
0593* TYPE 3 (UNDIMENSIONED) SEARCH FOR CORRESPONDING
0594* TYPE 3 OR TYPE 1 OR TYPE 2 ARRAY
0595*
0596 07620 000000 SSYMT NOP
0597 07621 070163 STA STEMP STORE IDENTIFIER
0598 07622 010336 AND .15 ISOLATE IDENTIFIER TYPE
0599 07623 040434 ADA M4
0600 07624 002024 SSA,INA
0601 07625 027631 JMP **+4 JUMP IF ARRAY TYPE
0602 07626 060163 LDA STEMP RESTORE A
0603 07627 070001 STA 1 STORE IN B
0604 07630 027643 JMP SYMT1+3
0605 07631 002020 SSA SKIP IF UNDIMENSIONED
0606 07632 027640 JMP SYMT1
0607 07633 060163 LDA STEMP RESTORE A
0608 07634 010437 AND MSK3 177771B SET TYPE TO 1
0609 07635 070001 STA 1
0610 07636 006004 INB SET TYPE IN B TO 2
0611 07637 027643 JMP **+4
0612 07640 007460 SYMT1 CCB SET DIMENSIONED FLAG IN B
0613 07641 060326 LDA .3
0614 07642 030163 IOR STEMP SET TYPE TO UNDEFINED
0615 07643 070164 STA STEMP+1 STORE A
0616 07644 074165 STB STEMP+2 STORE B
0617 07645 064116 LDB SYMTF START OF SYMBOL TABLE
0618 07646 027667 JMP SYMT4
0619 07647 160001 SYMT2 LDA 1,I PICK UP 1ST WORD OF ENTRY
0620 07650 050163 CPA STEMP COMPARE WITH IDENTIFIER
0621 07651 127620 JMP SSYMT,I MATCH ? RETURN
0622 07652 050164 CPA STEMP+1 COMPARE WITH DIFFERENT DIM.
0623 07653 027674 JMP SYMT3
0624 07654 050165 CPA STEMP+2 COMPARE WITH DIFFERENT DIM.
0625 07655 027674 JMP SYMT3
0626 07656 160001 LDA 1,I
0627 07657 010336 AND .15 ISOLATE ENTRY TYPE
0628 07660 050336 CPA .15 FUNCTION ?
0629 07661 027666 JMP **+5 YES
0630 07662 040434 ADA M4

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0631	07663	002020	SSA	ARRAY ?
0632	07664	006004	INB	YES INCREMENT POINTER
0633	07665	006004	INB	INCREMENT POINTER
0634	07666	044325	ADB .2	ADD 2 TO POINTER
0635	07667	054117	SYMT4 CPB SYMTA	SYMBOL TABLE EXHAUSTED?
0636	07670	007401	CCB,RSS	YES
0637	07671	027647	JMP SYMT2	NO, CHECK NEXT ENTRY FOR MATCH
0638	07672	060163	LDA STEMP	RETRIEVE SYMBOL
0639	07673	127620	JMP SSYMT,I	RETURN WITH B NEGATIVE
0640	07674	060163	SYMT3 LDA STEMP	RESTORE A
0641	07675	034165	ISZ STEMP+2	DIMENSIONED IDENTIFIER?
0642	07676	002001	RSS	NO, SKIP
0643	07677	170001	STA 1,I	YES CHANGE 1ST WORD OF ENTRY TO
0644	07700	127620	JMP SSYMT,I	APPROPRIATE DIMENSION TYPE

0002**

0003*** ERROR TABLE **

0004**

0005	07701	000266	ERR	DEF EUF+1	PREMATURE STATEMENT END
0006	07702	002066		DEF RTLE	INPUT EXCEEDS 71 CHARACTERS
0007	07703	002137		DEF INVSC	SYSTEM COMMAND NOT RECOGNIZED
0008	07704	002236		DEF SYNE1	NO STATEMENT TYPE FOUND
0009	07705	000717		DEF NUMER+1	BAD EXPONENT PART
0010	07706	002656		DEF SYE16	NO LETTER WHERE EXPECTED
0011	07707	002346		DEF SYNE2	LET STATEMENT HAS NO STORE
0012	07710	002361		DEF SYNE3	ILLEGAL COM STATEMENT
0013	07711	002406		DEF SYNE4+1	NO FUNCTION IDENTIFIER (OR BAD)
0014	07712	002420		DEF SYNE5	MISSING PARAMETER
0015	07713	002425		DEF SYNE6+1	MISSING ASSIGNMENT OPERATOR
0016	07714	002445		DEF SYNE7	MISSING 'THEN'
0017	07715	002453		DEF SYNE8+1	MISSING OR IMPROPER FOR-VARIABLE
0018	07716	002465		DEF SYNE9	MISSING 'TO'
0019	07717	002500		DEF SYE10	BAD 'STEP' PART IN FOR STATEMENT
0020	07720	001330		DEF CALER	CALLED ROUTINE DOES NOT EXIST
0021	07721	002541		DEF SYE11+1	WRONG NUMBER OF CALL PARAMETERS
0022	07722	000614		DEF SYE12	NO CONSTANT WHERE EXPECTED
0023	07723	002561		DEF SYE13	NO VARIABLE WHERE EXPECTED
0024	07724	002613		DEF SYE14	NO CLOSING QUOTE FOR STRING
0025	07725	002625		DEF SYE15	PRINT JUXTAPOSES FORMULAS
0026	07726	002671		DEF SYE17	IMPROPER WORD IN MAT STATEMENT
0027	07727	002702		DEF SYE18	NO COMMA WHERE EXPECTED
0028	07730	002755		DEF SYE19	IMPROPER ARRAY FUNCTION
0029	07731	002775		DEF SYE20	NO SUBSCRIPT WHERE EXPECTED
0030	07732	003007		DEF SYE21	ARRAY INVERSION INTO SELF
0031	07733	003020		DEF SYE22	MISSING MULTIPLICATION OPERATOR
0032	07734	003041		DEF SYE23	IMPROPER ARRAY OPERATOR
0033	07735	003060		DEF SYE24+1	ARRAY MULTIPLICATION INTO SELF
0034	07736	003202		DEF FSCE1+1	MISSING LEFT PARENTHESIS
0035	07737	003256		DEF FSCE2+1	MISSING RIGHT PARENTHESIS
0036	07740	003306		DEF FSCE3+1	UNRECOGNIZED OPERAND
0037	07741	003534		DEF ARRE1	MISSING SUBSCRIPT
0038	07742	003547		DEF ARRE2	MISSING ARRAY IDENTIFIER

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0039	07743	004345	DEF SYE25+1	MISSING OR BAD INTEGER
0040	07744	000267	DEF NOEOF+1	CHARACTERS AFTER STATEMENT END
0041	07745	003402	DEF FSCE4+1	OUT OF CORE DURING SYNTAX
0042	07746	002170	DEF PRERR	PHOTO READER NOT READY
0043	07747	005312	DEF MER4	FUNCTION MULTIPLY DEFINED
0044	07750	005413	DEF MER6	UNMATCHED FOR STATEMENT
0045	07751	005264	DEF MER3	UNMATCHED NEXT
0046	07752	005512	DEF MER8	OUT OF STORAGE-SYMBOL TABLE
0047	07753	005541	DEF MSYM	INCONSISTENT DIMENSIONS
0048	07754	005301	DEF MLOP6	LAST STATEMENT IS NOT 'END'
0049	07755	005377	DEF MER5	ARRAY DOUBLE DIMENSIONED
0050	07756	005431	DEF MER10	NO OF DIMENSIONS UNSPECIFIED
0051	07757	001352	DEF MER9	ARRAY TOO LARGE
0052	07760	005464	DEF MER7	OUT OF STORAGE-ARRAY ALLOCATION
0053	07761	006760	DEF E6	SUBSCRIPT TOO LARGE
0054	07762	001526	DEF E8	UNDEFINED OPERAND ACCESSED
0055	07763	007057	DEF BASER	NEGATIVE BASE POWERED TO REAL
0056	07764	007153	DEF POWER	ZERO TO ZERO POWER
0057	07765	006054	DEF XEC5	MISSING STATEMENT
0058	07766	006363	DEF E2	GOSUBS NESTED 10 DEEP
0059	07767	006367	DEF E3	RETURN FINDS NO ADDRESS
0060	07770	006135	DEF E4	OUT OF DATA
0061	07771	001474	DEF E1+1	OUT OF STORAGE - EXECUTION
0062	07772	011766	DEF E7	RE-DIMENSIONED ARRAY TOO LARGE
0063	07773	012036	DEF LERR+1	DIMENSIONS NOT COMPATIBLE
0064	07774	012100	DEF LCHKS	MATRIX UNASSIGNED
0065	07775	012704	DEF LDUM1	NEARLY SINGULAR MATRIX
0066	07776	010420	DEF TRBER	ARGUMENT TOO LARGE
0067	07777	010771	DEF SQRER	SQRT HAS NEGATIVE ARGUMENT
0068	10000	011077	DEF LOGER	LOG OF NEGATIVE ARGUMENT
0069	10001		RCERK EQU *	** RECOVERABLE ERRORS FOLLOW **
0070	10001	001100	DEF OVRER	OVERFLOW
0071	10002	001074	DEF UNDER	UNDERFLOW
0072	10003	011151	DEF LNZR	LOG OF ZERO
0073	10004	011305	DEF EXPER	EXPONENTIAL OVERFLOW
0074	10005	007547	DEF DBYZR	DIVIDE BY ZERO
0075	10006	007156	DEF ZRTNG	ZERO TO NEGATIVE POWER
0076*				
0077*				
0078	10007	006412	EBLFF OCT 6412	
0079	10010	042522	ASC 3,ERROR	
0080	10013	000000	EBFFF BSS 2	
0081	10015	020111	LBUFF ASC 5, IN LINE	
0082	10022	000000	LNBFF BSS 2	

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0084**
0085*** PREDEFINED FUNCTION JUMP TABLE **
0086**
0087 10024 006605 PDFT DEF ETAB
0088 10025 010647 DEF ESIN
0089 10026 010645 DEF ECOS
0090 10027 010406 DEF ETAN
0091 10030 010532 DEF EATN
0092 10031 011177 DEF EEXP
0093 10032 011070 DEF ELOG
0094 10033 010642 DEF EABS
0095 10034 010765 DEF ESQR
0096 10035 011055 DEF EINT
0097 10036 010736 DEF ERND
0098 10037 011166 DEF ESGN
0099**
0100*** OUTPUT A NUMBER **
0101**
0102 10040 000000 NUMOT NOP NUMBER IN (A) AND (B)
0103 10041 071603 STA EXPON SAVE NUMBER
0104 10042 002041 SEZ,RSS SIGN?
0105 10043 026055 JMP NS2 NO
0106 10044 002021 SSA,RSS YES, NEGATIVE NUMBER?
0107 10045 026052 JMP NS1 NO
0108 10046 015423 JSB ARINV YES, INVERT IT
0109 10047 071603 STA EXPON
0110 10050 060354 LDA .45
0111 10051 002001 RSS
0112 10052 060345 NS1 LDA .32 STORE
0113 10053 070153 STA SIGN SIGN
0114 10054 061603 LDA EXPON
0115 10055 076344 NS2 STB GETDG SAVE NUMBER
0116 10056 015364 JSB IFIX INTEGERIZE
0117 10057 000000 NOP
0118 10060 162040 LDA NUMOT,I SET
0119 10061 072101 STA NUM01 END-OF-LINE
0120 10062 072135 STA NUM03 OPERATION
0121 10063 036040 ISZ NUMOT BUMP RETURN ADDRESS
0122 10064 102201 SOC WAS IT AN INTEGER?
0123 10065 026110 JMP NUM02 NO
0124**
0125*** OUTPUT AN INTEGER **
0126**
0127 10066 002400 CLA SAVE
0128 10067 074174 STB B1+1 INTEGER
0129 10070 044462 ADB M1000 5 OR MORE
0130 10071 006021 SSB,RSS CHARACTERS?
0131 10072 040326 ADA .3 YES
0132 10073 040330 ADA .6 COMPUTE
0133 10074 040133 ADA CCNT END-OF-FIELD
0134 10075 003004 CMA,INA SAVE MARKER TO
0135 10076 070172 STA MLBX1+1 END-OF-FIELD
0136 10077 040367 ADA .74 ENOUGH
0137 10100 002020 SSA ROOM?
0138 10101 000000 NUM01 NOP NO
0139 10102 060153 LDA SIGN

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0140	10103 002002	SZA	SIGN?
0141	10104 015715	JSB OUTCR	YES, OUTPUT IT
0142	10105 060174	LDA B1+1	OUTPUT
0143	10106 114222	JSB OUTIA,I	THE INTEGER
0144	10107 126040	JMP NUMOT,I	
0145	10110 003400	NUM02 CCA	SET 'FIXED'
0146	10111 073032	STA FFLAG	FLAG FALSE
0147	10112 061603	LDA EXPON	LOAD
0148	10113 066344	LDB GETDG	NUMBER
0149	10114 114236	JSB .FADA,I	IS NUMBER
0150	10115 000472	DEF MAXFX	LESS THAN
0151	10116 002021	SSA,RSS	999999.5 ?
0152	10117 026127	JMP NUM05	NO
0153	10120 061603	LDA EXPON	YES, IS
0154	10121 066344	LDB GETDG	NUMBER
0155	10122 114236	JSB .FADA,I	LESS
0156	10123 000474	DEF MINFX	THAN
0157	10124 064335	LDB .12	0.09999995?
0158	10125 002021	SSA,RSS	
0159	10126 037032	ISZ FFLAG	NO, SET FFLAG = 0 AND SKIP
0160	10127 064336	NUM05 LDB .15	YES, LOAD 'FLOATING' FIELD WIDTH
0161	10130 044133	ADB CCNT	SAVE
0162	10131 007004	CMB,INB	END-OF-FIELD
0163	10132 074172	STB MLBX1+1	MARKER
0164	10133 044370	ADB .75	ROOM
0165	10134 006020	SSB	ENOUGH?
0166	10135 000000	NUM03 NOP	NO

0167**

0168*** OUTPUT A FLOATING POINT NUMBER **

0169**

0170	10136 061603	LDA EXPON	
0171	10137 071274	STA MANT1	
0172	10140 066344	LDB GETDG	UNPACK
0173	10141 015456	JSB .FLUN	
0174	10142 075336	STB MANT2	NUMBER
0175	10143 070154	STA EXP	
0176	10144 060153	LDA SIGN	
0177	10145 002002	SZA	SIGN?
0178	10146 015715	JSB OUTCR	YES, OUTPUT IT
0179	10147 002400	CLA	INITIALIZE COUNTER
0180	10150 071603	STA EXPON	FOR DECIMAL EXPONENT
0181	10151 080154	CPA EXP	EXponent ZERO?
0182	10152 026175	JMP EOUT4	YES
0183	10153 015147	EOLT2 JSB MBY10	NO,
0184	10154 060154	LDA EXP	MULTIPLY
0185	10155 003004	CMA,INA	NUMBER BY 10
0186	10156 002020	SSA	UNTIL
0187	10157 026162	JMP *+3	IT IS
0188	10160 035603	ISZ EXPON	GREATER
0189	10161 026153	JMP EOUT2	THAN 1
0190	10162 015200	JSB DBY10	DIVIDE BY 10
0191	10163 061603	LDA EXPON	
0192	10164 064154	EOLT3 LDB EXP	DIVIDE
0193	10165 007004	CMB,INB	NUMBER
0194	10166 006021	SSB,RSS	BY 10
0195	10167 026175	JMP EUUT4	UNTIL

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0196	10170	071603	STA EXPON	IT IS
0197	10171	015200	JSB DBY10	LESS
0198	10172	003400	CCA	THAN
0199	10173	041603	ADA EXPON	1
0200	10174	026164	JMP EOUT3	
0201	10175	003000	EOUT4 CMA	SET EXPONENT
0202	10176	071603	STA EXPON	TO TRUE VALUE-1
0203	10177	064437	LDB M7	SET DIGIT
0204	10200	076370	STB RETCR	COUNTER
0205	10201	007400	CCB	SET DECIMAL
0206	10202	075677	STB OUTLN	POINT FLAG
0207	10203	057032	CPB FFLAG	FIXED POINT?
0208	10204	026213	JMF EOUT6	NO
0209	10205	003000	CMA	YES, SET
0210	10206	071677	STA OUTLN	DECIMAL POINT FLAG
0211	10207	050324	CPA .1	.1?
0212	10210	026217	JMP EOUT5	YES
0213	10211	002021	SSA,RSS	LEADING DECIMAL POINT?
0214	10212	026225	JMP EOUT7+2	YES
0215	10213	016344	EOUT6 JSB GETD8	OUTPUT
0216	10214	040357	ADA .48	A
0217	10215	015715	JSB OUTCR	DIGIT
0218	10216	026227	JMP EOUT8	
0219	10217	060355	EOUT5 LDA .46	OUTPUT
0220	10220	015715	JSB OUTCR	DECIMAL POINT
0221	10221	060357	LDA .48	OUTPUT
0222	10222	026226	JMP EOUT8-1	LEADING ZERO
0223	10223	035677	EOUT7 ISZ OUTLN	DECIMAL POINT NEXT?
0224	10224	026213	JMP EOUT6	NO
0225	10225	060355	LDA .46	YES,
0226	10226	015715	JSB OUTCR	OUTPUT IT
0227	10227	036370	EOUT8 ISZ RETCR	MORE MANTISSA?
0228	10230	026223	JMP EOUT7	YES
0229	10231	060133	LDA CCNT	NO,
0230	10232	072101	STA NUM01	SAVE
0231	10233	060132	LDA BADDR	OUTPUT
0232	10234	072135	STA NUM03	POINTERS
0233	10235	016344	JSB GETDG	NEXT DIGIT
0234	10236	040435	ADA M5	FIVE OR
0235	10237	002020	SSA	GREATER?
0236	10240	026303	JMP EOUT1	NO
0237	10241	003400	CCA	SET DECIMAL
0238	10242	071274	ERND1 STA SYMCK	POINT COUNTER
0239	10243	016370	JSB RETCR	RETRIEVE CHARACTER
0240	10244	050355	CPA .46	DECIMAL POINT?
0241	10245	026241	JMP ERND1-1	YES, FLAG IT
0242	10246	015570	JSB DIGCK	NO, DIGIT?
0243	10247	026262	JMP ERND2	NO
0244	10250	050333	CPA .9	YES, .9?
0245	10251	026254	JMP *+3	YES
0246	10252	040360	ADA .49	NO, BUMP
0247	10253	026276	JMP ERND3	DIGIT 1
0248	10254	060357	LDA .48	OVERLAY
0249	10255	015715	JSB OUTCR	A ZERO
0250	10256	016370	JSB RETCR	BACKSPACE
0251	10257	003400	CCA	DECREMENT

0252	10260	041274	ADA SYMCK	DECIMAL POINT
0253	10261	026242	JMP ERND1	COUNTER
0254	10262	015715	ERND2 JSB OUTCR	RESTORE CHARACTER
0255	10263	035603	ISZ EXPON	CORRECT
0256	10264	000000	NOP	EXPONENT
0257	10265	060360	LDA .49	OVERLAY A 1
0258	10266	067032	LDB FFLAG	FIXED
0259	10267	006002	SZB	POINT?
0260	10270	026276	JMP ERND3	NO
0261	10271	015715	JSB OUTCR	YES, OUTPUT CHARACTER
0262	10272	060357	LDA .48	PREPARE TO OVERLAY A ZERO
0263	10273	035274	ISZ SYMCK	DECIMAL POINT NEXT?
0264	10274	026271	JMP *-3	NO
0265	10275	060355	LDA .46	YES
0266	10276	015715	ERND3 JSB OUTCR	RESTORE
0267	10277	062101	LDA NUM01	OUTPUT
0268	10300	070133	STA CCNT	POINTERS
0269	10301	062135	LDA NUM03	
0270	10302	070132	STA BADDR	
0271	10303	037032	EOLT1 ISZ FFLAG	NO, FIXED POINT?
0272	10304	026333	JMP EOUT9	YES
0273	10305	060364	LDA E	NO,
0274	10306	015715	JSB OUTCR	OUTPUT 'E'
0275	10307	060354	LDA .45	LOAD '-'
0276	10310	065603	LDB EXPON	POSITIVE
0277	10311	006020	SSB	EXONENT?
0278	10312	007005	CMA, INB, RSS	NO
0279	10313	060353	LDA .43	YES, LOAD '+'
0280	10314	075603	STB EXPON	OUTPUT SIGN
0281	10315	015715	JSB OUTCR	
0282	10316	065603	LDB EXPUN	
0283	10317	060357	LDA .48	COMPUTE
0284	10320	044442	ADB M10	
0285	10321	006020	SSB	EXONENT
0286	10322	026325	JMP *+3	
0287	10323	002004	INA	DIGIT
0288	10324	026320	JMP *-4	
0289	10325	044361	ADB .58	COMPUTE
0290	10326	075603	STB EXPON	SECOND DIGIT
0291	10327	015715	JSB OUTCR	OUTPUT
0292	10330	061603	LDA EXPON	
0293	10331	015715	JSB OUTCR	EXONENT
0294	10332	126040	JMP NUMOT,I	
0295	10333	016370	EOLT9 JSB RETCR	RETRIEVE CHARACTER
0296	10334	050357	CPA .48	ZERO?
0297	10335	026340	JMP EOU10	YES
0298	10336	015715	JSB OUTCR	NO, RESTORE CHARACTER
0299	10337	126040	JMP NUMOT,I	
0300	10340	060345	EOL10 LDA .32	OVERLAY
0301	10341	015715	JSB OUTCR	A BLANK
0302	10342	016370	JSB RETCR	BACKSPACE
0303	10343	026333	JMP EUUT9	

PAGE 0114 #08 EXECUTE THE PROGRAM

0305**
0306*** GET DIGIT TO OUTPUT **
0307**
0308 10344 000000 GETDG NOP
0309 10345 015147 JSB MBY1W MULTIPLY BY 10
0310 10346 064154 LDW EXP GET EXPONENT IN (B)
0311 10347 007004 CMB,INB AS NEGATIVE
0312 10350 010430 AND HIMSK KEEP 5 HIGH BITS OF (A)
0313 10351 001200 RAL NORMALIZE TO BIT 15
0314 10352 006024 SSB,INB ROTATE INTEGER
0315 10353 026351 JMP *-2 INTO (A)
0316 10354 010376 AND MSK0 EXTRACT
0317 10355 070615 STA NUMCK DIGIT
0318 10356 064154 LDB EXP ROTATE
0319 10357 007004 CMB,INB
0320 10360 001300 RAR BACK
0321 10361 006024 SSB,INB
0322 10362 026360 JMP *-2
0323 10363 021274 XOR MANT1 REMOVE
0324 10364 065336 LDB MANT2 DIGIT
0325 10365 015113 JSB NORML NORMALIZE REMAINDER
0326 10366 060615 LDA NUMCK LOAD (A) WITH DIGIT
0327 10367 126344 JMP GETDG,I
0328**
0329*** RETRIEVE CHARACTER FROM OUTPUT BUFFER **
0330**
0331 10370 000000 RETCR NOP
0332 10371 064133 LDB CCNT DECREMENT
0333 10372 044431 ADB M1 CHARACTER
0334 10373 074133 STB CCNT COUNT
0335 10374 160132 LDA BADDR,I POSITION
0336 10375 006011 SLB,RSS AND
0337 10376 001727 ALF,ALF EXTRACT
0338 10377 010376 AND MSK0 CHARACTER
0339 10400 004010 SLB FIRST CHARACTER OF WORD?
0340 10401 126370 JMP RETCR,I NO
0341 10402 064132 LDB BADDR YES, DECREMENT
0342 10403 044431 ADB M1 BUFFER
0343 10404 074132 STB BADDR POINTER
0344 10405 126370 JMP RETCR,I
0345*
0346*
0347 06074 A1 EQU SETDP
0348 06105 A2 EQU STSRH
0349 06147 C1 EQU FLWST
0350 06163 C2 EQU FVSRH

LIBRARY ROUTINES

PAGE 0115 #08 LIBRARY ROUTINES

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0352*      ****
0353*      SUBROUTINE TO CALCULATE TAN(X)
0354*      ****
0355*
0356*      CALLED BY A JMP ETAN WITH THE ARGUMENT
0357*      IN FLOATING RADIAN S IN THE REGISTERS.
0358*      THE FLOATING RESULT IS RETURNED IN A & B
0359*

0360 10406 114240  ETAN   JSB .FMPA,I
0361 10407 010475      DEF FOPI    4/PI
0362 10410 072501      STA XTEMP
0363 10411 076502      STB XTEMP+1
0364 10412 114236      JSB .FADA,I
0365 10413 010477      DEF K1
0366 10414 017440      JSB .PWR2
0367 10415 177776      DEC -2
0368 10416 017413      JSB .IENT
0369 10417 014477      JSB ERROR
0370 10420 017432  TRGER JSB FLOAT
0371 10421 015423      JSB ARINV
0372 10422 017440      JSB .PWR2
0373 10423 000002      DEC 2
0374 10424 114236      JSB .FADA,I
0375 10425 010501      DEF XTEMP
0376 10426 072501      STA XTEMP
0377 10427 076502      STB XTEMP+1  X=X-4*ENTIER((X+1)/4)
0378 10430 114237      JSB .FSBA,I
0379 10431 010477      DEF K1
0380 10432 073032      STA SBOX   TEMPORARY
0381 10433 002020      SSA       X<1?
0382 10434 026467      JMP ELSE1  YES
0383 10435 062507      LDA K2    NO
0384 10436 066510      LDB K2+1
0385 10437 114237      JSB .FSBA,I
0386 10440 010501      DEF XTEMP
0387 10441 072503  B01H1 STA YTEMP
0388 10442 076504      STB YTEMP+1  Y= 2-X
0389 10443 114240      JSB .FMPA,I
0390 10444 010503      DEF YTEMP
0391 10445 114240      JSB .FMPA,I
0392 10446 010507      DEF K2
0393 10447 114237      JSB .FSBA,I
0394 10450 010477      DEF K1
0395 10451 017324      JSB .CHEB
0396 10452 010511      DEF COEFF
0397 10453 114240      JSB .FMPA,I
0398 10454 010503      DEF YTEMP
0399 10455 072503      STA YTEMP
0400 10456 076504      STB YTEMP+1  Y=Y*CHEBY(2*Y**2-1)
0401 10457 063032      LDA SBOX
0402 10460 002020      SSA       X<1 ?
0403 10461 026472      JMP ELSE2  YES
0404 10462 062477      LDA K1
0405 10463 066500      LDB K1+1
0406 10464 114241      JSB .FDVA,I
0407 10465 010503      DEF YTEMP

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PAGE 0116 #08 LIBRARY ROUTINES

0408	10466	124264	JMP	FR12A,I	ANS = 1/Y
0409	10467	062501	ELSE1	LDA	XTEMP
0410	10470	066502		LDB	XTEMP+1
0411	10471	026441		JMP	BOTH1 Y=X
0412	10472	062503	ELSE2	LDA	YTEMP
0413	10473	066504		LDB	YTEMP+1
0414	10474	124264		JMP	FR12A,I
0415*					ANS = Y
0416	10475	050574	F0PI	DEC	1.273239545 4/PI
0417	10477	040000	K1	DEC	1.
0418	10501	000000	XTEMP	BSS	2
0419	10503	000000	YTEMP	BSS	2
0420	10505	000000	UTEMP	BSS	2
0421	10507	040000	K2	DEC	2.
0422	10511	076061	COEFF	DEC	1.4458E-8
0423	10513	066034		DEC	2.013766E-7
0424	10515	057035		DEC	2.804816E-6
0425	10517	050755		DEC	3.906637E-5
0426	10521	043523		DEC	5.4417038E-4
0427	10523	076112		DEC	7.586101578E-3
0428	10525	066520		DEC	.10675392857
0429	10527	070512		DEC	1.7701474227
0430	10531	000000		OCT	0

PAGE 0117 #08 LIBRARY ROUTINES

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0432*      ****
0433*      SUBROUTINE TO CALCULATE ATN(X)
0434*      ****
0435*
0436*      CALLED BY A JMP EATN WITH THE ARGUMENT
0437*      IN FLOATING POINT FORM IN THE REGISTERS.
0438*      THE FLOATING RESULT IN THE RANGE -PI/2
0439*      TO PI/2 IS RETURNED IN A & B
0440*
0441 10532 072501 EATN STA XTEMP
0442 10533 076502 STB XTEMP+1
0443 10534 060001 LDA 1
0444 10535 010376 AND MSK0
0445 10536 073032 STA SBOX      TAN = EXP OF (X)
0446 10537 002002 SZA
0447 10540 000010 SLA      ABS (X) > 1 ?
0448 10541 026576 JMP ELS1      NO
0449 10542 062477 LDA K1
0450 10543 066500 LDB K1+1
0451 10544 114241 JSB .FDVA,I
0452 10545 010501 DEF XTEMP      U=1/X
0453 10546 072505 BTH1 STA UTEMP
0454 10547 076506 STB UTEMP+1
0455 10550 114240 JSB .FMPA,I
0456 10551 010505 DEF UTEMP
0457 10552 114240 JSB .FMPA,I
0458 10553 010507 DEF K2
0459 10554 114237 JSB .FSBA,I
0460 10555 010477 DEF K1
0461 10556 017324 JSB .CHEB
0462 10557 010615 DEF COEF
0463 10560 114240 JSB .FMPA,I
0464 10561 010505 DEF UTEMP
0465 10562 072503 STA YTEMP
0466 10563 076504 STB YTEMP+1      Y=U*CHEBY(2*U**2-1)
0467 10564 063032 LDA SBOX
0468 10565 002002 SZA
0469 10566 000010 SLA      ABS(X)>1 ?
0470 10567 026601 JMP ELS2      NO
0471 10570 062501 LDA XTEMP
0472 10571 002020 SSA      X<0 ?
0473 10572 026604 JMP ELS3      YES
0474 10573 062611 LDA PIBY2
0475 10574 066612 LDB PIBY2+1
0476 10575 026606 JMP ELS3+2      ANS = PI/2 - Y
0477 10576 062501 ELS1 LDA XTEMP
0478 10577 066502 LDB XTEMP+1
0479 10600 026546 JMP BTH1      U=X
0480 10601 062503 ELS2 LDA YTEMP
0481 10602 066504 LDB YTEMP+1
0482 10603 124264 JMP FR12A,I      ANS = Y
0483 10604 062613 ELS3 LDA MP2
0484 10605 066614 LDB MP2+1
0485 10606 114237 JSB .FSBA,I
0486 10607 010503 DEF YTEMP      ANS=-PI/2-Y
0487 10610 124264 JMP FR12A,I

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PAGE 0118 #08 LIBRARY ROUTINES

0488*
0489 10611 062207 PIBY2 DEC 1.5707963268 PI/2
0490 10613 115570 MP2 DEC -1.5707963268 -PI/2
0491 10615 106671 COEF DEC -1.33034E-8
0492 10617 056335 DEC 8.64888E-8
0493 10621 131601 DEC -56.99186E-8
0494 10623 040033 DEC 3.821037E-6
0495 10625 111013 DEC -2.6215196E-5
0496 10627 060542 DEC 1.8574297E-4
0497 10631 122573 DEC -1.381195004E-3
0498 10633 055471 DEC .01113584206
0499 10635 111620 DEC -.1058929245
0500 10637 070320 DEC 1.762747174
0501 10641 000000 OCT 0

0503* *****
0504* SUEROUTINE TO COMPUTE ABS(X)
0505* *****
0506*
0507* CALLED BY A JMP EABS WITH THE ARGUMENT
0508* IN FLOATING POINT FORM IN THE REGISTERS.
0509* THE ABSOLUTE VALUE IN FLOATING POINT
0510* IS RETURNED IN A & B
0511*
0512 10642 002020 EABS SSA NEGATIVE?
0513 10643 015423 JSB ARINV YES, NEGATE IT
0514 10644 124264 JMP FR12A,I

PAGE 0119 #09 LIBRARY ROUTINES

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0002*      **** * * * * * * * * * * * * * * * * * * * * * * *
0003*      SUBROUTINE TO CALCULATE SIN(X)
0004*      * * * * * * * * * * * * * * * * * * * * * * * * * *
0005*
0006*      CALLED BY A JMP ESIN WITH THE ARGUMENT
0007*      IN FLOATING RADIAN S IN THE REGISTERS.
0008*      THE FLOATING RESULT IS RETURNED IN A & B
0009*
0010  10645 114236  ECOS  JSB .FADA,I
0011  10646 010611    DEF PIBY2
0012  10647 114240  ESIN   JSB .FMPA,I
0013  10650 010717    DEF TOPI
0014  10651 072501    STA XTEMP
0015  10652 076502    STB XTEMP+1   X=2*X/PI
0016  10653 114236    JSB .FADA,I
0017  10654 010477    DEF K1
0018  10655 017440    JSB .PWR2
0019  10656 177776    DEC -2
0020  10657 017413    JSB .IENT
0021  10660 026417    JMP TRGER-1   ERROR IF EXPONENT >= 15
0022  10661 017432    JSB FLOAT
0023  10662 114240    JSB .FMPA,I
0024  10663 010721    DEF MM4
0025  10664 114236    JSB .FADA,I
0026  10665 010501    DEF XTEMP
0027  10666 072501    STA XTEMP
0028  10667 076502    STB XTEMP+1   X=X-4*ENTIER((X+1)/4)
0029  10670 114237    JSB .FSBA,I
0030  10671 010477    DEF K1
0031  10672 002020    SSA           X<1 ?
0032  10673 026702    JMP PAST      YES
0033  10674 062507    LDA K2
0034  10675 066510    LDB K2+1
0035  10676 114237    JSB .FSBA,I
0036  10677 010501    DEF XTEMP
0037  10700 072501    STA XTEMP
0038  10701 076502    STB XTEMP+1   X=2-X
0039  10702 062501  PAST   LDA XTEMP
0040  10703 066502    LDB XTEMP+1
0041  10704 114240    JSB .FMPA,I
0042  10705 010501    DEF XTEMP
0043  10706 017440    JSB .PWR2
0044  10707 000001    DEC 1
0045  10710 114237    JSB .FSBA,I
0046  10711 010477    DEF K1
0047  10712 017324    JSB .CHEB
0048  10713 010723    DEF COEF1
0049  10714 114240    JSB .FMPA,I
0050  10715 010501    DEF XTEMP
0051  10716 124264    JMP FR12A,I   ANS=X+CHEBY(2*X**2-1)
0052*
0053  10717 050574  TOPI   DEC .636619772   2/PI
0054  10721 100000  MM4    DEC -4.
0055  10723 047605  COEF1  DEC 1.18496E-6
0056  10725 134143    DEC -1.365875E-4
0057  10727 045261    DEC 9.118016E-3

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PAGE 0120 #89 LIBRARY ROUTINES

0058	10731	133371	DEC -.2852615692
0059	10733	050656	DEC 2,5525579248
0060	10735	000000	OCT 0

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0062*      ****
0063*      SUBROUTINE TO COMPUTE RND(X)
0064*      ****
0065*
0066*      THE ARGUMENT OF RND IS A DUMMY ONE
0067*      THE ROUTINE GENERATES A RANDOM NUMBER
0068*      IN THE A & B REGISTERS
0069*
0070*      R=X/M, X=C*X MOD M, M=231, C=215 + 3
0071*
0072 10736 002400 ERNU CLA      X IS INITIALLY 1
0073 10737 070154 STA EXP      INITIALIZE EXPONENT
0074 10740 060155 LDA XH      COMPUTE
0075 10741 001000 ALS        HIGH
0076 10742 040155 ADA XH      PART
0077 10743 064156 LDB XL      2*XH
0078 10744 004065 CLE,ERB    + XH +
0079 10745 040001 ADA I       XL*215
0080 10746 064156 LDB XL
0081 10747 005275 RBL,CLE,SLB,ERB ADD XL[15] TO
0082 10750 002004 INA        (A) (FROM 2*XL)
0083 10751 004066 CLE,ELB    2*XL
0084 10752 044156 ADB XL      + XL
0085 10753 001675 ELA,CLE,SLA,ERA ADD OVERFLOW
0086 10754 002104 CLE,INA    TO (A)
0087 10755 044470 ADB FLGBT   ADD IN TRAILING BIT OF XL*215
0088 10756 002040 SEZ        ADD OVERFLOW
0089 10757 002004 INA        TO (A)
0090 10760 001665 ELA,CLE,ERA ERASE A[15]
0091 10761 070155 STA XH      STORE
0092 10762 074156 STB XL      INTEGER
0093 10763 015020 JSB .PACK   NORMALIZE AND PACK
0094 10764 124264 JMP FR12A,I

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PAGE 0121 #09 LIBRARY ROUTINES

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0096*      ****
0097*      SUBROUTINE TO CALCULATE SQR(X)
0098*      ****
0099*
0100*      CALLED BY A JMP ESQR WITH THE ARGUMENT
0101*      IN FLOATING POINT FORM IN THE REGISTERS.
0102*      THE FLOATING RESULT IS RETURNED IN A & B
0103*      ****

0104 10765 002003 ESCR SZA,RSS X=0 ?
0105 10766 124264 JMP FR12A,I YES, ANS = 0
0106 10767 002020 SSA X<0 ?
0107 10770 014477 JSB ERROR YES ERROR
0108 10771 072501 SQRER STA XTEMP
0109 10772 015456 JSB .FLUN
0110 10773 000031 SLA,ARS EXP(X) ODD?
0111 10774 027034 JMP ODD
0112 10775 040431 ADA M1
0113 10776 073032 STA SBOX SBOX=EXP0(X)/2-1
0114 10777 076502 STB XTEMP+1 LOW MANTISSA/2
0115 11000 062501 LDA XTEMP
0116 11001 114240 JSB .FMPA,I
0117 11002 011047 DEF SA2
0118 11003 114236 JSB .FADA,I
0119 11004 011053 DEF SB2 Y=SB2+SA2*X
0120 11005 072503 BT#2 STA YTEMP
0121 11006 076504 STB YTEMP+1
0122 11007 062501 LDA XTEMP
0123 11010 066502 LDB XTEMP+1
0124 11011 114241 JSB .FDVA,I
0125 11012 010503 DEF YTEMP
0126 11013 114236 JSB .FADA,I
0127 11014 010503 DEF YTEMP
0128 11015 017440 JSB .PWR2
0129 11016 177777 DEC -1
0130 11017 072503 STA YTEMP
0131 11020 076504 STB YTEMP+1 Y=(Y+X/Y)/2
0132 11021 062501 LDA XTEMP
0133 11022 066502 LDB XTEMP+1
0134 11023 114241 JSB .FDVA,I
0135 11024 010503 DEF YTEMP
0136 11025 114236 JSB .FADA,I
0137 11026 010503 DEF YTEMP
0138 11027 072503 STA YTEMP
0139 11030 076504 STB YTEMP+1
0140 11031 017440 JSB .PWR2
0141 11032 000000 SBCX OCT 0
0142 11033 124264 JMP FR12A,I ANS=(P+F/P)*2**SBOX
0143 11034 073032 ODE STA SBOX SBOX = EXP(X)/2
0144 11035 044376 ADB MSK0
0145 11036 076502 STB XTEMP+1 LOW MANTISSA/2
0146 11037 062501 LDA XTEMP
0147 11040 114240 JSB .FMPA,I
0148 11041 011045 DEF SA1
0149 11042 114236 JSB .FADA,I
0150 11043 011051 DEF SB1
0151 11044 027005 JMP BTH2 Y=SB1+SA1*X

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PAGE 0122 #09 LIBRARY ROUTINES

0152*
0153 11045 070000 SA1 DEC .875
0154 11047 045000 SA2 DEC .578125
0155 11051 043524 SB1 DEC .27863
0156 11053 066000 SB2 DEC .421875

0158* *****
0159* SUBROUTINE TO CALCULATE INT(X)
0160* *****
0161*
0162* CALLED BY A JMP EINT WITH THE ARGUMENT
0163* IN FLOATING POINT FORM IN THE REGISTERS.
0164* ENTIER(X) IS FLOATED AND RETURNED IN A & B
0165*
0166* CALCULATES THE FLOATING POINT EQUIVALENT
0167* OF ENTIER(X)
0168*
0169 11055 077032 EINT STB SBOX SAVE LOW WORD
0170 11056 064344 LDB .31 PRESET BIAS FOR
0171 11057 074154 STB EXP BINARY POINT
0172 11060 067032 LDB SBOX 24-BIT
0173 11061 015364 JSB IFIX INTEGER?
0174 11062 027065 JMP EINT1 NO
0175 11063 015020 JSB .PACK YES, PACK IT
0176 11064 124264 JMP FR12A,I
0177 11065 061614 EINT1 LDA GETCR RETRIEVE
0178 11066 067032 LDB SBOX NUMBER
0179 11067 124264 JMP FR12A,I

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```

0181*      ****
0182*      SUBROUTINE TO CALCULATE LOG(X)
0183*      ****
0184*
0185*      CALLED BY A JMP ELOG WITH THE ARGUMENT
0186*      IN FLOATING POINT FORM IN THE REGISTERS.
0187*      THE FLOATING RESULT IS RETURNED IN A & B
0188*
0189  11070 017072  ELCG  JSB .LOG
0190  11071 124264      JMP FR12A,I
0191  11072 000000  .LCG  NOP
0192  11073 002003      SZA,RSS      NON-ZERO ARGUMENT?
0193  11074 027150      JMP .LOG1      NO
0194  11075 002020      SSA           YES, POSITIVE ARGUMENT?
0195  11076 014477      JSB ERROR      NO
0196  11077 072501  LOGER  STA XTEMP      YES
0197  11100 015456      JSB .FLUN
0198  11101 076502      STB XTEMP+1
0199  11102 017432      JSB FLOAT
0200  11103 072503      STA YTEMP
0201  11104 076504      STB YTEMP+1      Y=EXP0(X)
0202  11105 062501      LDA XTEMP
0203  11106 066502      LDB XTEMP+1
0204  11107 114236      JSB .FADA,I
0205  11110 011154      DEF R22
0206  11111 072505      STA UTEMP
0207  11112 076506      STB UTEMP+1      U=X+SQR(0.5)
0208  11113 062501      LDA XTEMP
0209  11114 066502      LDB XTEMP+1
0210  11115 114237      JSB .FSBA,I
0211  11116 011154      DEF R22
0212  11117 114241      JSB .FDVA,I
0213  11120 010505      DEF UTEMP
0214  11121 072505      STA UTEMP
0215  11122 076506      STB UTEMP+1      U=(X-SQR(0.5))/U
0216  11123 114240      JSB .FMPA,I
0217  11124 010505      DEF UTEMP
0218  11125 114237      JSB .FSBA,I
0219  11126 011164      DEF CCC
0220  11127 072501      STA XTEMP
0221  11130 076502      STB XTEMP+1
0222  11131 063162      LDA MB
0223  11132 067163      LDB MB+1
0224  11133 114241      JSB .FDVA,I
0225  11134 010501      DEF XTEMP
0226  11135 114236      JSB .FADA,I
0227  11136 011160      DEF AAA
0228  11137 114240      JSB .FMPA,I
0229  11140 010505      DEF UTEMP
0230  11141 114237      JSB .FSBA,I
0231  11142 000466      DEF HALF
0232  11143 114236      JSB .FADA,I
0233  11144 010503      DEF YTEMP
0234  11145 114240      JSB .FMPA,I
0235  11146 011156      DEF LE2
0236  11147 127072      JMP .LOG,I      ANS=LOG(2)*(EXP0(X)-0.5+U*)

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0237*				(A-B/X))
0238	11150	014477	.LCG1 JSB ERROR	LOG OF ZERO
0239	11151	060470	LNR LDA MNE8	RETURN
0240	11152	064400	LDB B776	NEGATIVE
0241	11153	127072	JMP .LOG,I	INFINITY
0242*				
0243	11154	055202	R22 DEC .707106781	SQR(0.5)
0244	11156	054271	LE2 DEC .6931471806	LOG BASE E OF 2
0245	11150	051260	AAA DEC 1.2920070987	
0246	11162	125606	MB DEC -2.6398577035	
0247	11164	065010	CCC DEC 1.6567626301	

0249*	*****			
0250*	SUBROUTINE TO COMPUTE SGN(X)			
0251*	*****			
0252*				
0253*	CALLED BY A JMP ESGN WITH THE ARGUMENT			
0254*	IN FLOATING POINT FORM IN THE REGISTERS.			
0255*	ON RETURN A & B CONTAIN THE FOLLOWING:			
0256*				
0257*	IF X>0 THEN +1.			
0258*	IF X=0 THEN 0			
0259*	IF X<0 THEN -1.			
0260*				
0261	11166	006400	ESGN CLB	
0262	11167	002403	SZA,RSS	ZERO?
0263	11170	124264	JMP FR12A,I	YES
0264	11171	002021	SSA,RSS	NO, POSITIVE?
0265	11172	064325	LDB .2	YES, SET EXPONENT
0266	11173	060470	LDA FLGBT	LOAD MANTISSA
0267	11174	006002	SZB	POSITIVE?
0268	11175	001300	RAR	YES, CORRECT MANTISSA
0269	11176	124264	JMP FR12A,I	

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```

0271*      **** * * * * * * * * * * * * * * * * * * * * * * * * * * *
0272*      SUBROUTINE TO CALCULATE EXP(X)
0273*      **** * * * * * * * * * * * * * * * * * * * * * * * * * * *
0274*
0275*      CALLED BY A JMP EEXP WITH THE ARGUMENT
0276*      IN FLOATING POINT FORM IN THE REGISTERS.
0277*      THE FLOATING RESULT IS RETURNED IN A & B
0278*
0279  11177 017201  EEXP   JSB .EXP
0280  11200 124264    JMP FR12A,I
0281  11201 000000  .EXP   NOP
0282  11202 114240    JSB .FMPA,I
0283  11203 011322    DEF L2E
0284  11204 072501    STA XTEMP
0285  11205 076502    STB XTEMP+1    X=Z*LOG2(E)
0286  11206 017413    JSB .IENT
0287  11207 027301    JMP .EXP1
0288  11210 073274    STA INTE      INTE = ENTIER(X)
0289  11211 017432    JSB FLOAT
0290  11212 072503    STA YTEMP
0291  11213 076504    STB YTEMP+1    Y=ENTIER(X)
0292  11214 063274    LDA INTE
0293  11215 043310    ADA M124
0294  11216 002021    SSA,RSS      INTE >=124 ?
0295  11217 027304    JMP EXPER-1    YES,ERROR
0296  11220 043311    ADA .244     INTE <-120 ?
0297  11221 002020    SSA
0298  11222 027276    JMP ZERE      YES,ANS=0
0299  11223 062501    LDA XTEMP
0300  11224 066502    LDB XTEMP+1
0301  11225 114237    JSB .FSBA,I
0302  11226 010503    DEF YTEMP
0303  11227 072501    STA XTEMP
0304  11230 076502    STB XTEMP+1    X=X-ENTIER(X)
0305  11231 114240    JSB .FMPA,I
0306  11232 010501    DEF XTEMP
0307  11233 072505    STA UTEMP
0308  11234 076506    STB UTEMP+1    U=X**2
0309  11235 114236    JSB .FADA,I
0310  11236 011312    DEF AAAA
0311  11237 072503    STA YTEMP
0312  11240 076504    STB YTEMP+1    Y=X**2+AAAA
0313  11241 063314    LDA BBBB
0314  11242 067315    LDB BBBB+1
0315  11243 114241    JSB .FDVA,I
0316  11244 010503    DEF YTEMP
0317  11245 072503    STA YTEMP
0318  11246 076504    STB YTEMP+1    Y=BBBB/Y
0319  11247 063316    LDA CCCC
0320  11250 067317    LDB CCCC+1
0321  11251 114240    JSB .FMPA,I
0322  11252 010505    DEF UTEMP
0323  11253 114236    JSB .FADA,I
0324  11254 011320    DEF DDDD
0325  11255 114237    JSB .FSBA,I
0326  11256 010501    DEF XTEMP

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0327	11257	114237		JSB .FSBA,I
0328	11260	010503		DEF YTEMP
0329	11261	072503		STA YTEMP
0330	11262	076504		STB YTEMP+1 $Y = -X + DDDD + CCCC * X^{**2} - Y$
0331	11263	062501		LDA XTEMP
0332	11264	066502		LDB XTEMP+1
0333	11265	114241		JSB .FDVA,I
0334	11266	010503		DEF YTEMP
0335	11267	114236		JSB .FADA,I
0336	11270	000466		DEF HALF
0337	11271	037274		ISZ INTE
0338	11272	000000		NOP
0339	11273	017440		JSB ,PWR2
0340	11274	000000	INTE	OCT 0
0341	11275	127201		JMP .EXP,I ANS = (0.5 + X/Y) * 2**INTE
0342	11276	002400	ZERE	CLA
0343	11277	006400		CLB
0344	11300	127201		JMP .EXP,I ANS = 0
0345	11301	063401	.EXP1	LDA X2TMP
0346	11302	002020		SSA
0347	11303	027276		JMP ZERE
0348	11304	014477		JSB ERROR
0349	11305	060422	EXPER	LDA INF
0350	11306	064432		LDB M2
0351	11307	127201		JMP .EXP,I
0352*				
0353	11310	177604	M124	DEC -124
0354	11311	000364	.244	DEC 244
0355	11312	053552	AAAA	DEC 87.417497202
0356	11314	046477	BBBB	DEC 617.9722695
0357	11316	043372	CCCC	DEC .03465735903
0358	11320	047643	DDDD	DEC 9.9545957821
0359	11322	056125	L2E	DEC 1.4426950409

```

0361*      **** * * * * * * * * * * * * * * * * * * * * * * *
0362*      SUBROUTINE TO COMPUTE CHEBY(X)
0363*      **** * * * * * * * * * * * * * * * * * * * * * * *
0364*
0365*      CALLING SEQUENCE:
0366*
0367*      LDA X          (FLOATING)
0368*      LDB X+1
0369*      JSB .CHEB      (RESULT FLOATING)
0370*      DEF C          (TABLE OF CHEBY.COEFFS.,FLOATING)
0371*
0372 11324 000000 .CHEB NOP
0373 11325 114240 JSB .FMPA,I
0374 11326 010507 DEF K2
0375 11327 073401 STA X2TMP
0376 11330 077402 STB X2TMP+1 X2 =X*2
0377 11331 167324 LDB .CHEB,I
0378 11332 077407 STB CTMP      C POINTS TO COEFFICIENT TABLE
0379 11333 160001 LDA 1,I
0380 11334 006004 INB
0381 11335 164001 LDB 1,I      GET FIRST COEFF
0382 11336 073411 STA DTMP
0383 11337 077412 STB DTMP+1 D=C(N)
0384 11340 002400 CLA
0385 11341 073405 STA BTMP
0386 11342 073406 STA BTMP+1 B=0
0387 11343 037407 LOPC ISZ CTMP
0388 11344 037407 ISZ CTMP      N=N-1
0389 11345 163407 LDA CTMP,I
0390 11346 002003 SZA,RSS      C(N)=0 ?
0391 11347 027371 JMP COUT      ZERO FLAGS END OF TABLE
0392 11350 063405 LDA BTMP      NO
0393 11351 067406 LDB BTMP+1
0394 11352 073403 STA ATMP
0395 11353 077404 STB ATMP+1 A=B
0396 11354 063411 LDA DTMP
0397 11355 067412 LDB DTMP+1
0398 11356 073405 STA BTMP
0399 11357 077406 STB BTMP+1 B=D
0400 11360 114240 JSB .FMPA,I
0401 11361 011401 DEF X2TMP
0402 11362 114237 JSB .FSBA,I
0403 11363 011403 DEF ATMP
0404 11364 114236 JSB .FADA,I
0405 11365 111407 DEF CTMP,I
0406 11366 073411 STA DTMP
0407 11367 077412 STB DTMP+1 D=C(N) -A+B*X2
0408 11370 027343 JMP LOPC
0409 11371 063411 COLT LDA DTMP
0410 11372 067412 LDB DTMP+1
0411 11373 114237 JSB .FSBA,I
0412 11374 011403 DEF ATMP
0413 11375 114240 JSB .FMPA,I
0414 11376 000466 DEF HALF
0415 11377 037324 ISZ .CHEB
0416 11400 127324 JMP .CHEB,I      ANS=(D-A)/2

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```

0417*
0418 11401 000000 X2TMP BSS 2
0419 11403 000000 ATMP BSS 2
0420 11405 000000 BTMP BSS 2
0421 11407 000000 CTMP BSS 2
0422 11411 000000 DTMP BSS 2

```

```

0424* ***** SUBROUTINE TO COMPUTE THE ENTIER OF A NUMBER
0425* WHOSE EXPONENT IS LESS THAN 15
0426* ****
0427* ****
0428* ****

```

0429* CALLING SEQUENCE:

```

0430*
0431* LDA X          (FLOATING)
0432* LDA X+1
0433* JSB .IENT.    (RESULT INTERGER)
0434* JSB ERROR      (EXIT IF EXPO(X)>14)
0435*
0436*
0437 11413 000000 .IENT NOP
0438 11414 073401 STA X2TMP   STORE HIGH PART
0439 11415 060001 LDA 1       MOVE LOW PART TO A
0440 11416 010376 AND MSK0   ISOLATE EXPONENT
0441 11417 000033 SLA,RAR
0442 11420 027424 JMP *+4   IF NEGATIVE OK
0443 11421 040444 ADA M15
0444 11422 002021 RSA,RSS  EXPO(X) > 14
0445 11423 127413 JMP .IENT,I YES, ERROR RETURN
0446 11424 037413 ISZ .IENT NO BUMP RETURN POINT
0447 11425 063401 LDA X2TMP RESTORE HIGH PART
0448 11426 015364 JSB IFIX  CALL ENTIER
0449 11427 000000 NOP
0450 11430 060001 LDA 1       PUT RESULT INTO (A)
0451 11431 127413 JMP .IENT,I

```

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```

0453*      ****
0454*      SUBROUTINE TO FLOAT AN INTEGER
0455*      ****
0456*
0457*      CALLED BY JSB FLOAT WITH INTEGER IN A
0458*      THE FLOATING POINT EQUIVALENT IS RETURNED
0459*      IN A & B
0460*
0461 11432 000000 FLCAT NOP
0462 11433 064336 LDB .15
0463 11434 074154 STB EXP
0464 11435 006400 CLB
0465 11436 015020 JSB .PACK
0466 11437 127432 JMP FLOAT,I

```

```

0468*      ****
0469*      SUBROUTINE TO MULTIPLY BY A POWER OF TWO
0470*      ****
0471*
0472*      CALLING SEQUENCE
0473*
0474*      LDA X          (FLOATING)
0475*      LDB X+1
0476*      JSB .PWR2      (RESULT FLOATING)
0477*      DEC N          (INTEGER POWER)
0478*
0479*      RETURNS WITH X*2^N IN A&B
0480*      NO CHECK IS MADE FOR EXPONENT
0481*      OVERFLOW OR UNDERFLOW
0482*
0483 11440 000000 .PWR2 NOP
0484 11441 002003 SZA,RSS      X=0 ?
0485 11442 027454 JMP .RET      YES, ANS=0
0486 11443 073401 STA X2TMP
0487 11444 015456 JSB .FLUN
0488 11445 077402 STB X2TMP+1
0489 11446 143440 ADA .PWR2,I
0490 11447 001200 RAL
0491 11450 010376 AND MSK0      NEW EXPO = (OLD EXPO) +N
0492 11451 070001 STA 1
0493 11452 047402 ADB X2TMP+1  KEEP OLD MANTISSA
0494 11453 063401 LDA X2TMP
0495 11454 037440 .RET      ISZ .PWR2
0496 11455 127440 JMP .PWR2,I

0498 07463   TT1 EQU .FDV
0499 07552   TT2 EQU IDIV
0500 00163   TT3 EQU TEMPS+4
0501 00164   TT4 EQU TEMPS+5
0502 11032   FFLAG EQU SBOX

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0002*		*****	*****
0003*		MATRIX STMT EXECUTION CONTROL	
0004*		*****	*****
0005	11456 160157	EMAT LDA TEMPS,I	
0006	11457 034157	ISZ TEMPS	MAT READ
0007	11460 010401	AND MSK1	OR
0008	11461 002002	SZA	MAT PRINT?
0009	11462 027610	JMP EMAT7	NO
0010	11463 160157	LDA TEMPS,I	YES
0011	11464 010420	AND OPMSK	SAVE
0012	11465 070171	STA MLBX1	TYPE
0013	11466 050416	CPA RDOP	PRINT?
0014	11467 002001	RSS	NO
0015	11470 114250	JSB PRNIA,I	YES
0016*			
0017	11471 160157	EMAT1 LDA TEMPS,I	LOAD
0018	11472 010401	AND MSK1	OPERAND
0019	11473 002003	SZA,RSS	NULL? (END OF MAT PRINT)
0020	11474 124256	JMP XEC4A,I	YES
0021	11475 114231	JSB SSYMA,I	NO, SEARCH SYMBOL TABLE
0022	11476 006007	INB,SZB,RSS	FOUND?
0023	11477 124267	JMP E8M1A,I	NO
0024	11500 034157	ISZ TEMPS	YES
0025	11501 160001	LDA 1,I	SAVE ARRAY
0026	11502 070173	STA B1	BASE ADDRESS
0027	11503 060171	LDA MLBX1	
0028	11504 050416	CPA RDOP	READ?
0029	11505 027561	JMP EMAT5	YES
0030	11506 044325	ADB .2	NO
0031	11507 160001	LDA 1,I	SAVE
0032	11510 070174	STA B1+1	DIMENSIONS
0033	11511 010376	AND MSK0	SET
0034	11512 003004	CMA,INA	COLUMN
0035	11513 070175	STA B2	COUNTERS
0036	11514 070176	STA B2+1	
0037	11515 160001	LDA 1,I	SET
0038	11516 001727	ALF,ALF	
0039	11517 010376	AND MSK0	ROW
0040	11520 003004	CMA,INA	
0041	11521 070177	STA B3	COUNTER
0042	11522 114255	JSB LCK2A,I	ENSURE ARRAY IS DEFINED
0043	11523 002400	CLA	SET DELIMITER
0044	11524 073767	STA MCKS	AS COMMA
0045	11525 060157	LDA TEMPS	MORE
0046	11526 050143	CPA PRADD	STATEMENT?
0047	11527 027540	JMP EMAT3	NO
0048	11530 160157	LDA TEMPS,I	YES
0049	11531 010420	AND OPMSK	EXTRACT DELIMITER
0050	11532 050404	CPA B3000	SEMICOLON?
0051	11533 037767	ISZ MCKS	YES
0052	11534 027540	JMP EMAT3	
0053	11535 006400	EMAT2 CLB	COMMA
0054	11536 057767	CPB MCKS	DELIMETER?
0055	11537 015656	JSB EDELM	YES
0056	11540 160173	EMAT3 LDA B1,I	LOAD
0057	11541 034173	ISZ B1	NEXT

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0058	11542	164173	LDB B1,I	ELEMENT
0059	11543	034173	ISZ B1	
0060	11544	015643	JSB ENOUT	OUTPUT IT
0061	11545	034175	ISZ B2	ROW COMPLETE?
0062	11546	027535	JMP EMAT2	NO
0063	11547	015677	JSB OUTLN	YES, DO
0064	11550	015677	JSB OUTLN	SPACING
0065	11551	060176	LDA B2+1	RESET
0066	11552	070175	STA B2	COLUMN COUNTER
0067	11553	034177	ISZ B3	ARRAY EXHAUSTED?
0068	11554	027540	JMP EMAT3	NO
0069	11555	064157	EMAT4 LDB TEMPS	YES, MORE
0070	11556	054143	CPB PRADD	STATEMENT?
0071	11557	124256	JMP XEC4A,I	NO
0072	11560	027471	JMP EMAT1	YES
0073*				
0074	11561	074175	EMAT5 STB B2	SAVE SYMBOL TABLE POINTER
0075	11562	160157	LDA TEMPS,I	EXTRACT
0076	11563	010420	AND OPMASK	NEXT OPERATOR
0077	11564	064157	LDB TEMPS	STATEMENT
0078	11565	054143	CPB PRADD	EXHAUSTED?
0079	11566	002400	CLA	YES
0080	11567	050412	CPA B2200	'{' ?
0081	11570	017732	JSB KEDIM	YES, REDIMENSION ARRAY
0082	11571	060175	LDA B2	LOAD
0083	11572	040325	ADA .2	ARRAY
0084	11573	160000	LDA 0,I	DIMENSIONS
0085	11574	015336	JSB MDIM	SET
0086	11575	001100	ARS	ARRAY
0087	11576	003004	CMA,INA	ELEMENT
0088	11577	070177	STA B3	COUNTER
0089	11600	114254	EMAT6 JSB FDAT,I	FETCH VALUE
0090	11601	170173	STA B1,I	STORE
0091	11602	034173	ISZ B1	
0092	11603	174173	STB B1,I	IT
0093	11604	034173	ISZ B1	
0094	11605	034177	ISZ B3	ARRAY EXHAUSTED?
0095	11606	027600	JMP EMAT6	NO
0096	11607	027555	JMP EMAT4	YES
0097*				
0098	11610	114231	EMAT7 JSB SSYMA,I	SAVE
0099	11611	006004	INB	BASE ADDRESS
0100	11612	160001	LDA 1,I	OF DESTINATION
0101	11613	070177	STA B3	ARRAY
0102	11614	074175	STB B2	SAVE SYMBOL TABLE ADDRESS
0103	11615	044325	ADB .2	SAVE
0104	11616	160001	LDA 1,I	ITS
0105	11617	070200	STA B3+1	DIMENSIONS
0106	11620	002404	CLA,INA	ASSUME MAT
0107	11621	071656	STA EDELM	REPLACEMENT
0108	11622	160157	EMAT8 LDA TEMPS,I	LOAD NEXT
0109	11623	034157	ISZ TEMPS	OPERAND
0110	11624	002020	SSA	ARRAY FUNCTION?
0111	11625	027711	JMP EMA11	YES
0112	11626	010401	EMAT8 AND MSK1	NO
0113	11627	002003	SZA,RSS	SCALAR MULTIPLICATION?

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0114	11630	027701	JMP EMA10	YES
0115	11631	114231	JSB SSYMA,I	NO
0116	11632	006004	INB	SAVE
0117	11633	160001	LDA 1,I	BASE
0118	11634	070173	STA B1	ADDRESS AND
0119	11635	044325	ADB .2	DIMENSIONS
0120	11636	160001	LDA 1,I	OF FIRST
0121	11637	070174	STA B1+1	SOURCE ARRAY
0122	11640	064157	LDB TEMPS	STATEMENT
0123	11641	054143	CPB PRADD	EXHAUSTED?
0124	11642	027662	JMP EMAT9	YES
0125	11643	160157	LDA TEMPS,I	NO
0126	11644	001100	ARS	EXTRACT
0127	11645	001727	ALF,ALF	AND
0128	11646	010362	AND .63	RECORD
0129	11647	040436	ADA M6	EMAT
0130	11650	071656	STA EDELM	OPERATOR
0131	11651	160157	LDA TEMPS,I	SAVE
0132	11652	010401	AND MSK1	
0133	11653	114231	JSB SSYMA,I	BASE ADDRESS
0134	11654	006004	INB	
0135	11655	160001	LDA 1,I	AND DIMENSIONS
0136	11656	070175	STA B2	
0137	11657	044325	ADB .2	OF SECOND
0138	11660	160001	LDA 1,I	
0139	11661	070176	STA B2+1	SOURCE ARRAY
0140*				
0141	11662	061656	EMAT9 LDA EDELM	TRANSFER TO
0142	11663	043666	ADA LMAP	APPROPRIATE
0143	11664	114000	JSB 0,I	ROUTINE
0144	11665	124256	JMP XEC4A,I	
0145*				
0146	11666	111666	LMAP DEF LBASE=1,I	
0147	11667	012123	LBASE DEF REPLC	
0148	11670	012103	DEF ADD	
0149	11671	012116	DEF SUB	
0150	11672	012331	DEF MULT	
0151	11673	012170	DEF SZER	
0152	11674	012145	DEF LCON	
0153	11675	012176	DEF LIDN	
0154	11676	012441	DEF LINV	
0155	11677	012266	DEF TRAN	
0156	11700	012137	DEF SMULT	
0157*				
0158	11701	060334	EMA10 LDA .10	SET SMULT
0159	11702	071656	STA EDELM	OPERATOR
0160	11703	114232	JSB FETCA,I	EVALUATE
0161	11704	070171	STA MLBX1	AND SAVE
0162	11705	074172	STB MLBX1+1	SCALAR
0163	11706	034157	ISZ TEMPS	GO TO
0164	11707	034157	ISZ TEMPS	PROCESS
0165	11710	027622	JMP EMAT0	SOURCE ARRAY
0166*				
0167	11711	001727	EMA11 ALF,ALF	EXTRACT
0168	11712	001700	ALF	
0169	11713	010344	AND .31	TYPE

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0170	11714	040440	ADA M8	RECORD EMAT
0171	11715	071656	STA EDELM	OPERATOR TYPE
0172	11716	040440	ADA M8	INV OR
0173	11717	002020	SSA	TRN?
0174	11720	027725	JMP EMA12	NO
0175	11721	160157	LDA TEMPS,I	YES, LOAD
0176	11722	034157	ISZ TEMPS	SOURCE
0177	11723	034157	ISZ TEMPS	ARRAY
0178	11724	027626	JMP EMAT8	SYMBOL
0179*				
0180	11725	064157	EMA12 LDB TEMPS	REDIMENSIONING
0181	11726	054143	CPB PRADD	PART?
0182	11727	027662	JMP EMAT9	NO
0183	11730	017732	JSB REDIM	YES
0184	11731	027662	JMP EMAT9	

0186*				
0187*				
0188*				
0189	11732	000000	***** SUBROUTINE TO REDIMENSION ARRAY *****	
0190	11733	017767	REDIM NOP	
0191	11734	005727	JSB MCKS	EVALUATE
0192	11735	074200	BLF,BLF	AND SAVE
0193	11736	006404	STB B3+1	ROW COUNT
0194	11737	034157	CLB,INB	LOAD DEFAULT COLUMN COUNT
0195	11740	160157	ISZ TEMPS	SINGLE
0196	11741	010420	LDA TEMPS,I	DIMENSION
0197	11742	050407	AND OPMASK	ARRAY?
0198	11743	027746	CPA LF	
0199	11744	017767	JMP REDI1	YES
0200	11745	034157	JSB MCKS	NO, EVALUATE COLUMN COUNT
0201	11746	034157	ISZ TEMPS	MOVE PAST
0202	11747	044200	REDI1 ISZ TEMPS	RIGHT BRACKET
0203	11750	074200	ADB B3+1	PACK
0204	11751	060175	STB B3+1	DIMENSIONS
0205	11752	040325	LDA B2	STORE IN
0206	11753	174000	ADA .2	SYMBOL
0207	11754	040431	STB 0,I	TABLE
0208	11755	160000	ADA M1	COMPUTE
0209	11756	015336	LDA 0,I	PHYSICAL
0210	11757	070172	JSB MDIM	ARRAY SPACE
0211	11760	060200	STA MLBX1+1	SIZE
0212	11761	015336	LDA B3+1	COMPUTE
0213	11762	003004	JSB MDIM	NEW SIZE
0214	11763	040172	CMA,INA	NEW
0215	11764	002020	ADA MLBX1+1	SIZE
0216	11765	014477	SSA	ACCEPTABLE?
0217	11766	127732	JSB ERROR	NO
		E7	JMP REDIM,I	YES

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```
0219*      ****  
0220*      SUBROUTINE TO EVALUATE & CHECK A SUBSCRIPT  
0221*      ****  
0222 11767 000000 MCKS NOP  
0223 11770 114232 JSB FETCA,I CALL FOR EVALUATION  
0224 11771 015353 JSB SBFIX CONVERT TO INTEGER (ROUNDED)  
0225 11772 006004 INB UNBIAS SUBSCRIPT  
0226 11773 060001 LDA 1 PUT INTO (A)  
0227 11774 040460 ADA M256 LESS THAN  
0228 11775 002021 S8A,RSS 256?  
0229 11776 124272 JMP E6M1A,I NO  
0230 11777 127767 JMP MCKS,I YES, RETURN SUBSCRIPT IN (B)
```

0232 12000 ORG 12000B

0233*

0234***** MATRIX ROUTINES *****

0235***** MATRIX ROUTINES *****

0236***** CALL FOR MATRIX OPERATION IS MADE WITH FOUR*****

0237*PARAMETERS,ROUTINE NUMBER AND ADDRESS OF *

0238*SUPER TABLE OF THREE MATRICES. FOR SCALAR *

0239*MULT, LAST IS ADDRESS OF SCALAR VALUE *

0240*OPERATION IS OF FCRM B3=B1 OP B2 *

0241*THE ADDRESS OF THE BASE ADDRESS OF MATRICES*

0242*IS GIVEN IN B1,B2,B3. THE DIMENSIONS OF A *

0243*MATRIX IS GIVEN IN B(1)+1, ROWS IN MOST SIG*

0244*PART(MSP) AND COLUMN IN LEAST SIG PART(LSP)*

0245*****

0246*****

0247*

0248*

0249*

0250*****

0251*** SUBROUTINE GENERAL ***

0252*****

0253*B3=B1 OP B2 SUBROUTINE COMPUTES AN ELEMENT*

0254*OF B3 AND INCREMENTS TO NEXT ELEMENT. THE *

0255*OPERATION THAT IS PERFORMED AND *

0256* THE MATRICES INCREMENTED ARE *

0257* MODIFIED BY ROUTINES ADD, SUB, REPL *

0258*SCALAR MULT, CON,ZERO, IDN. ROUTINE CHECKS *

0259*COMPATIBILITY OF THREE MATRICES USING SUB *

0260*COMPARE (PARAMETERS SUPPLIED IN REG A,B) *

0261*****

0262*

0263 12000 000000	GENR NOP	SUBROUTINE GENERAL
0264 12001 060176	LDA B2+1	LOAD DIM FOR MATRIX 2
0265 12002 064174	LDB B1+1	LOAD DIM FOR MATRIX 1
0266 12003 016032	JSB COMPR	CHECKS ROW AND COL DIM
0267*		ARE COMPATIBLE
0268 12004 060174	GEN2 LDA B1+1	LOAD DIM FOR MATRIX 1
0269 12005 064200	LDB B3+1	LOAD DIM FOR MATRIX 3
0270 12006 016032	JSB COMPR	CHECK ROW AND COL DIM
0271 12007 015236	JSB MPY	COLUMNS IN (A)
0272 12010 013115	DEF T3	ROWS IN T3
0273 12011 003004	CMA,INA	-ROWS*COLUMNS
0274 12012 073134	STA LPIV	COMPUTES B3=B1 OP B2
0275*		LOAD
0276 12013 160173	LOOP LDA B1,I	NEXT
0277 12014 034173	ISZ B1	SOURCE
0278 12015 164173	LDB B1,I	ELEMENT
0279 12016 034173	ISZ B1	USUALLY A JSB
0280 12017 000000	MUL1 NOP	USUALLY DEF B2,I
0281 12020 000000	NOP	STORE
0282 12021 170177	STA B3,I	NEXT
0283 12022 034177	ISZ B3	DESTINATION
0284 12023 174177	STB B3,I	ELEMENT
0285 12024 034177	ISZ B3	ISZ B2 FOR
0286 12025 000000	MUL2 NOP	MAT ADD OR SUB
0287 12026 000000	NOP	

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```

0288 12027 037134      ISZ LPIV
0289 12030 026013      JMP LOOP      COMPUTE NEXT ELEMENT
0290 12031 126000      JMP GENER,I
0291*
0292*
0293*****
0294**** SUBROUTINE COMPARE ****
0295*****ROUTINE COMPARES IIM OF TWO MATRICES GIVEN *
0296*THEIR DIM IN REGISTERS A,B   *
0297*DIMENSIONS ARE GIVEN IN B(I)+2   *
0298*****DIMENSIONS ARE GIVEN IN B(I)+2   *
0299*****
0300*
0301 12032 000000  COMPR NOP
0302 12033 050001      CPA 1      EQUAL?
0303 12034 002001      RSS       YES
0304 12035 014477  LERR JSB ERROR NO
0305 12036 001727      ALF,ALF    SAVE
0306 12037 010376      AND MSK0   # OF
0307 12040 073115      STA T3    ROWS
0308 12041 060001      LDA 1
0309 12042 010376      AND MSK0   SAVE #
0310 12043 073116      STA T4    OF COLUMNS
0311 12044 126032      JMP COMPR,I
0312*
0313*
0314*****
0315**** SUBROUTINE LCHK ****
0316*****TESTS THAT NO ELEMENT IN A MATRIX IS
0317*UNASSIGNED. ENTRY1 CHECKS MATRICES GIVEN BY*
0318*B1 AND B2 AND ENTRY 2 CHECKS ONLY B1   *
0319*****B1 AND B2 AND ENTRY 2 CHECKS ONLY B1   *
0320*****
0321*
0322 12045 000000  LCHK2 NOP
0323 12046 062045      LDA LCHK2
0324 12047 072051      STA LCHK1
0325 12050 026055      JMP *+5
0326 12051 000000  LCHK1 NOP
0327 12052 064175      LDB B2      BASE ADDR
0328 12053 060176      LDA B2+1   ROW AND COL DIM.
0329 12054 016061      JSB LCHK4   TEST EACH TERM OF B2
0330 12055 064173      LDB B1      BASE ADDR
0331 12056 060174      LDA B1+1   ROW AND COL DIM.
0332 12057 016061      JSB LCHK4   TEST EACH TERM OF B1
0333 12060 126051      JMP LCHK1,I
0334*
0335 12061 000000  LCHK4 NOP      SUBROUTINE TO TEST TERMS
0336 12062 077120      STB T6      SAVE
0337 12063 015336      JSB MDIM   COMPUTE SIZE OF MATRIX
0338 12064 001100      ARS        SET NEGATIVE
0339 12065 003004      CMA,INA
0340 12066 073121      STA T7      COUNTER FOR ELEMENTS
0341 12067 163120  LCHK6 LDA T6,I LOAD
0342 12070 037120      ISZ T6
0343 12071 167120      LDB T6,I ELEMENT

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0344	12072	037120	ISZ T6	
0345	12073	050470	CPA MNEG	COMPARE WITH PRESET QTY.
0346	12074	026076	JMP *+2	
0347	12075	026100	JMP LCHK5	
0348	12076	054471	CPB MNEG+1	
0349	12077	014477	JSB ERROR	ERROR 'MAT UNASSIGNED'
0350	12100	037121	LCHK5 ISZ T7	DONE?
0351	12101	026067	JMP LCHK6	NO
0352	12102	126061	JMP LCHK4,I	YES

0353*

0354*

0355*****

0356**** SUBROUTINE MATRIX ADD *****

0357*****

0358*B1,B2,B3 CONTAIN ADDRESS OF BASE ADDRESS OF*

0359*THREE MATRICES. RCUITNE EXECUTES B3=B1+B2 *

0360*BY MODIFYING INSTE IN ROUTINE GENERAL *

0361*****

0362*

0363	12103	000000	ADD	NOP	
0364	12104	063135	LDA	LPLUS	JSB .FAD
0365	12105	072017	ADD1	STA MOD1	SET IN GENER
0366	12106	063136	LDA	LPLUS+1	DEF OF B2,I
0367	12107	072020	STA	MOD1+1	MODIFY ROUTINE GENERAL
0368	12110	063141	LDA	INC82	ISZ B2
0369	12111	072025	STA	MOD2	
0370	12112	072026	STA	MOD2+1	
0371	12113	016051	JSB	LCHK1	TEST B1,B2 FOR UNASSIGNED TERMS
0372	12114	016000	JSB	GENER	ROUTINE GENERAL
0373	12115	126103	JMP	ADD,I	EXIT TO MAIN PROGRAM

0374*

0375*

0376*****

0377**** SUBROUTINE MATRIX SUBTRACT *****

0378*****

0379*B1,B2,B3 CONTAIN ADDRESS OF BASE ADDRESS OF*

0380*THREE MATRICES. RCUITNE EXECUTES B3=B1-B2 *

0381*BY MODIFYING INSTR IN ROUTINE GENERAL *

0382*****

0383*

0384	12116	000000	SUB	NOP	LET
0385	12117	062116	LDA	SUB	ADD DO
0386	12120	072103	STA	ADD	RETURN
0387	12121	063137	LDA	LMIN	JSB .FSB
0388	12122	026105	JMP	ADD1	

0390*

0391*****
 0392**** SUBROUTINE MATRIX REPLACE ****
 0393*****
 0394*B1,B3 GIVE ADDRESS OF BASE ADDRESS OF GIVEN*
 0395*MATRIX AND RECEIVING MATRIX RESPECTIVELY *
 0396*****

0397	12123	000000	REPLC	NOP	LET
0398	12124	062123	LDA	REPLC	GENER DO
0399	12125	072000	STA	GENER	RETURN
0400	12126	002400	CLA		NO
0401	12127	006400	CLB		OPERATION
0402	12130	072017	REPL1	STA MOD1	SET
0403	12131	076020	STB	MOD1+1	OPERATION
0404	12132	002400	CLA		B2
0405	12133	072025	STA	MOD2	NOT
0406	12134	072026	STA	MOD2+1	USED
0407	12135	016045	J8B	LCHK2	TEST B1 FOR UNASSIGNED ELEMENTS
0408	12136	026004	JMP	GEN2	

0409*

0410*

0411*****
 0412**** SUBROUTINE MATRIX SCALAR MULT ****
 0413*****
 0414*B1,B3 GIVE ADDRESS OF BASE ADDRESS OF GIVEN*
 0415*MATRIX AND RECEIVING MATRIX RESPECTIVELY *
 0416*MBXL HOLDS ADDRESS OF SCALAR VALUE *
 0417*****

0418*

0419	12137	000000	SMULT	NOP	LET
0420	12140	062137	LDA	SMULT	GENER DO
0421	12141	072000	STA	GENER	RETURN
0422	12142	063140	LDA	LTIME	SET FOR
0423	12143	064323	LDB	MBXL	MULTIPLY
0424	12144	026130	JMP	REPL1	

0425*

0426*

0427*****
 0428**** SUBROUTINE MATRIX CON ****
 0429*****
 0430*SETS MATRIX TO ALL ONES. B3 IS ADDRESS OF *
 0431*BASE ADDRESS OF MATRIX. *
 0432*****
 0433*

0434	12145	000000	LCON	NOP	
0435	12146	060466	LDA	HONE	
0436	12147	064325	LDB	.2	
0437	12150	070171	LCCN1	STA MLBX1	SET
0438	12151	074172	STB	MLBX1+1	CONSTANT
0439	12152	060200	LDA	B3+1	
0440	12153	015336	J8B	MDIM	SET
0441	12154	001100	ARS		ELEMENT
0442	12155	003004	CMA,INA		COUNTER
0443	12156	073134	STA	LPIV	
0444	12157	060171	LDA	MLBX1	LOAD
0445	12160	064172	LDB	MLBX1+1	CONSTANT

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```

0446 12161 170177 LCCN2 STA B3,I      STORE
0447 12162 034177 ISZ B3             IN
0448 12163 174177 STB B3,I          NEXT
0449 12164 034177 ISZ B3             ELEMENT
0450 12165 037134 ISZ LPIV          DONE?
0451 12166 026161 JMP LCON2         NO
0452 12167 126145 JMP LCON,I        YES
0453*
0454*
0455***** SUBROUTINE MATRIX ZERO *****
0456**** SETS MATRIX TO ZERO. B3 IS ADDRESS OF BASE *
0457**** ADDRESS OF MATRIX. B1,B2 ARE REDUNDANT   *
0458**** SET B1=0 AND USE SUBROUTINE CON,ENTRY2    *
0459**** SET B1=0 AND USE SUBROUTINE CON,ENTRY2    *
0460**** SET B1=0 AND USE SUBROUTINE CON,ENTRY2    *
0461***** ****
0462*
0463 12170 000000 SZER NOP
0464 12171 062170 LDA SZER           CONVERT
0465 12172 072145 STA LCON
0466 12173 002400 CLA               LCON
0467 12174 006400 CLB
0468 12175 026150 JMP LCON1        TO SZER
0469*
0470*
0471***** ****
0472**** SUBROUTINE MATRIX IDN *****
0473***** ****
0474**** ROUTINE SETS UP IDENTITY MATRIX   *
0475**** B3 IS ADDRESS OF BASE ADDRESS OF MATRIX   *
0476**** USE SZER TO SET MATRIX TO ALL ZEROS. ON   *
0477**** RETURN CHECK FOR SQUARE MATRIX.       *
0478***** ****
0479*
0480 12176 000000 LIDN NOP
0481 12177 060177 LDA B3             SAVE BASE ADDRESS
0482 12200 073123 STA T9             SET ALL MATRIX TO ZERO
0483 12201 016170 JSB SZER
0484 12202 060200 LDA B3+1          IS
0485 12203 001727 ALF,ALF          ARRAY
0486 12204 050200 CPA B3+1          SQUARE?
0487 12205 001010 ALS,SLA          YES
0488 12206 026035 JMP LERR          NO
0489 12207 010401 AND MSK1          SAVE ROW
0490 12210 070171 STA MLBX1         LENGTH
0491 12211 061100 ARS              SAVE
0492 12212 003004 CMA,INA          ROW
0493 12213 070172 STA MLBX1+1      COUNTER
0494 12214 067123 LDB T9             RESTORE
0495 12215 074177 STB B3             B3
0496 12216 060466 LIDN1 LDA HONE  STORE
0497 12217 170001 STA 1,I            1,0 ON
0498 12220 006004 INB
0499 12221 060325 LDA .2
0500 12222 170001 STA 1,I            DIAGONAL
0501 12223 006004 INB

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0502	12224	044171	ADB	MLBX1	MOVE TO NEXT DIAGONAL ELEMENT
0503	12225	034172	ISZ	MLBX1+1	DONE?
0504	12226	026216	JMP	LIDN1	NO
0505	12227	126176	JMP	LIDN,I	YES
0506*					
0507*					
0508*****					
0509*****				SUBROUTINES DLD AND DST	*****
0510*****					
0511*					
0512*					
0513*					
0514	12230	000000	.DLD	NOP	
0515	12231	016250	JSB	GETAD	GET ADDRESS
0516	12232	112230	DEF	.DLD,I	
0517	12233	036230	ISZ	.DLD	BUMP RETURN ADDRESS
0518	12234	162264	LDA	ADRES,I	LOAD HIGH PART.
0519	12235	036264	ISZ	ADRES	
0520	12236	166264	LDB	ADRES,I	LOAD LOW PART.
0521	12237	126230	JMP	.DLD,I	
0522*					
0523	12240	000000	.DST	NOP	
0524	12241	016250	JSB	GETAD	GET ADDRESS.
0525	12242	112240	DEF	.DST,I	
0526	12243	036240	ISZ	.DST	BUMP RETURN ADDRESS.
0527	12244	172264	STA	ADRES,I	STORE HIGH PART.
0528	12245	036264	ISZ	ADRES	
0529	12246	176264	STB	ADRES,I	STORE LOW PART.
0530	12247	126240	JMP	.DST,I	
0531*					
0532	12250	000000	GETAD	NOP	COMPUTES EFFECTIVE ADDRESS.
0533	12251	072265	STA	TINY	SAVE A REGISTER.
0534	12252	162250	LDA	GETAD,I	GET POINTER TO ADDRESS.
0535	12253	072264	GET	STA ADRES	STORE IN ADRES.
0536	12254	062265	LDA	TINY	RESTORE A REGISTER.
0537	12255	162264	LDA	ADRES,I	
0538	12256	001275	RAL,CLE,SLA,ERA	TEST FOR INDIRECT	
0539	12257	026253	JMP	GET	IT IS INDIRECT.
0540	12260	072264	STA	ADRES	EFFECTIVE ADDRESS.
0541	12261	062265	LDA	TINY	
0542	12262	036250	ISZ	GETAD	
0543	12263	126250	JMP	GETAD,I	
0544	12264	000000	ADRES	BSS 1	
0545	12265	000000	TINY	BSS 1	

0547*

0548***** SUBROUTINE TRANSPOSE *****

0549**** SUBROUTINE TRANSPOSE *****

0550***** TRANSPOSE OF FORM B3(M,N)=T(B1(N,M)) *

0551*B1,B3 GIVE ADDRESS OF BASE ADDRESS OF GIVEN*

0552*AND RECEIVING MATRICES RESPECTIVELY. *

0553*****

0554*****

0555*

0556 12266 000000	TRAN NOP	
0557 12267 016045	JSB LCHK2	TEST B1 FOR UNASSIGNED TERMS
0558*		CHECK DIMENSIONS
0559 12270 060200	LDA B3+1	PARAMETERS OF B3
0560 12271 001727	ALF,ALF	INTERCHANGE ROW AND COLUMN
0561 12272 064174	LDB B1+1	PARAMETERS OF B1
0562 12273 016032	JSB COMPR	SUBROUTINE COMPARE
0563*		DIMENSIONS COMPATIBLE
0564 12274 015236	JSB MPY	# OF COLUMNS IN (A)
0565 12275 013115	DEF T3	# OF ROWS IN T3
0566 12276 073134	STA LPIV	PRODUCT OF ROW*COL
0567 12277 063116	LDA T4	SET
0568 12300 003004	CMA,INA	COLUMN
0569 12301 073117	STA T5	COUNTER
0570*		T6 IS INDICATOR TO SELECT
0571*		WHICH ELEMENT IN A COL OF
0572*		B1 IS TO BE TRANSPOSED
0573 12302 002400	TRAN1 CLA	
0574 12303 073120	STA T6	SET T6=0
0575 12304 067120	LNEXT LDB T6	LOAD
0576 12305 005000	BLS	
0577 12306 044173	ADA B1	NEXT ELEMENT
0578 12307 160001	LDA 1,I	
0579 12310 006004	INB	OF COLUMN
0580 12311 164001	LDB 1,I	
0581 12312 170177	STA B3,I	STORE
0582 12313 034177	ISZ B3	IN
0583 12314 174177	STB B3.I	ROW
0584 12315 034177	ISZ B3	
0585 12316 063120	LDA T6	SET T6=T6+T4
0586 12317 043116	ADA T4	T6 POINTS TO NEXT TERM IN
0587 12320 073120	STA T6	A COLUMN TO BE TRANSPOSED
0588 12321 053134	CPA LPIV	TEST FOR LAST IN COL
0589 12322 026324	JMP *+2	
0590 12323 026304	JMP LNEXT	
0591*		SET BASE ADDRESS TO FIRST
0592*		TERM IN NEXT COLUMN
0593 12324 034173	ISZ B1	
0594 12325 034173	ISZ B1	
0595 12326 037117	ISZ T5	
0596 12327 026302	JMP TRAN1	TRANSPOSE NEXT COL
0597 12330 126266	JMP TRAN,I	EXIT TO MAIN PROGRAM

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0002*
0003***** SUBROUTINE MATRIX MULT *****
0005*****ROUTINE IS OF FORM B3(M,P)=B1(M,N)*B2(N,P) *
0007*B1,B2,B3 ARE ADDRESSES OF BASE ADDRESSES OF*
0008*THREE MATRICES *
0009*****
0010*
0011 12331 000000 MULT NOP
0012 12332 016051 J88 LCHK1 TEST B1,B2 FOR UNASSIGNED TERMS
0013* CHECK DIMENSIONS
0014 12333 060200 LDA B3+1 PARAMETERS OF B3
0015 12334 010376 AND MSK0 SAVE COLUMN COUNT
0016 12335 073120 STA T6
0017 12336 060176 LDA B2+1 PARAMETERS OF B2
0018 12337 010376 AND MSK0
0019 12340 053120 CPA T6 COLUMNS EQUAL
0020 12341 002001 RSS IN NUMBER?
0021 12342 026035 JMP LERR NO
0022* COMBINE B3,B2 PARAMETERS
0023* INTO (M,N) AND COMPARE
0024* WITH THOSE OF B1
0025 12343 060200 LDA B3+1 PARAMETERS OF B3
0026 12344 010460 AND M256
0027 12345 070001 STA 1 STORE ROW IN MSP OF B
0028 12346 060176 LDA B2+1 PARAMETERS OF B2
0029 12347 001727 ALF,ALF GET ROW COUNT
0030 12350 010376 AND MSK0
0031 12351 040001 ADA 1
0032 12352 064174 LDB B1+1
0033 12353 016032 JSB COMPR COMPARE ROW AND COL
0034* DIMENSIONS ARE COMPATIBLE
0035* M,N ARE STORED IN T3,T4
0036* SAVE B2 AS DESTROYED IN
0037 12354 060175 LDA B2 MULT
0038 12355 073117 STA T5
0039 12356 063115 LDA T3 SET
0040 12357 003004 CMA,INA ROW
0041 12360 073123 STA T9 COUNTER
0042 12361 063120 MULT4 LDA T6
0043 12362 003004 CMA,INA
0044 12363 073124 STA T10 SET COUNTER
0045 12364 063117 LDA T5
0046 12365 070175 STA B2 RESTORE BASE ADDRESS B2
0047 12366 002400 MULT3 CLA
0048 12367 073125 STA T11 COUNTER FOR B2. INCR BY
0049* 2*P AND POINTS TO NEXT TERM
0050* IN COL TO BE MULTIPLIED
0051 12370 073126 STA T12 COUNTER FOR B1. INCR BY 2
0052* AND POINTS TO NEXT TERM
0053* IN ROW TO BE MULTIPLIED
0054 12371 006400 CLB
0055 12372 016240 JSB .DST CLEAR TO ZERO
0056 12373 100177 DEF B3,I
0057 12374 064173 MULT2 LDB B1 COMPUTE PROD OF ONE TERM

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PAGE 0143 #11 MATRIX ROUTINES

0058	12375	047126	ADB T12	IN ROW BY ONE TERM IN COL
0059	12376	077132	STB T18	
0060	12377	064175	LDB B2	
0061	12400	047125	ADB T11	
0062	12401	016230	JSB .DLD	
0063	12402	100001	DEF 1,I	
0064	12403	114240	JSB .FMPA,I	
0065	12404	113132	DEF T18,I	
0066	12405	114236	JSB .FADA,I	COMPUTES RUNNING SUM
0067	12406	100177	DEF B3,I	
0068	12407	016240	JSB .DST	
0069	12410	100177	DEF B3,I	
0070	12411	037126	ISZ T12	SELECT NEXT TERM IN ROW
0071	12412	037126	ISZ T12	
0072	12413	063120	LDA T6	SELECT NEXT TERM IN COL
0073	12414	001000	ALS	
0074	12415	043125	ADA T11	
0075	12416	073125	STA T11	
0076*				TEST IF HAVE MULT ONE ROW BY ONE COLUMN
0077*				
0078	12417	063116	LDA T4	
0079	12420	001000	ALS	
0080	12421	053126	CPA T12	
0081	12422	026424	JMP *+2	
0082	12423	026374	JMP MULT2	MULT AND ADD IN NEXT TERM SUMMATION OF PRODUCTS FOR ONE TERM OF B3 IS DONE MULT SAME ROW BY NEXT COL INCR RECEIVING MAT
0083*				
0084*				
0085*				
0086	12424	034177	ISZ B3	
0087	12425	034177	ISZ B3	
0088	12426	034175	ISZ B2	BASE ADDRESS OF NEXT COL
0089	12427	034175	ISZ B2	
0090*				TEST IF HAVE MULT ONE ROW BY ALL COLUMNS
0091*				
0092	12430	037124	ISZ T10	SKIP IF INNERPRODUCT DONE
0093	12431	026366	JMP MULT3	COMPUTE SAME ROW*NEXT COL
0094*				SELECT NEXT ROW
0095	12432	063116	LDA T4	
0096	12433	001000	ALS	
0097	12434	040173	ADA B1	
0098	12435	070173	STA B1	ADDRESS OF NEXT ROW
0099	12436	037123	ISZ T9	
0100	12437	026361	JMP MULT4	MULT ROW BY ALL COLUMNS
0101	12440	126331	JMP MULT,I	EXIT TO MAIN PROGRAM

PAGE 0144 #11 MATRIX RUTINES

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0103*
0104*****
0105**** SUBROUTINE MATRIX INVERT ****
0106*****
0107*OPERATION OF FORM MAT B3 = INV B1 *
0108*B1,B3 ARE ADDRESSES OF BASE ADDRESS OF *
0109*MATRIX TO BE INVERTED AND RECEIVING MATRIX *
0110*RESPECTIVELY. B2 IS REDUNDANT. METHOD USED *
0111*IS GAUSSIAN ELIMINATION WITH COLUMN *
0112*PIVOTING *
0113*****
0114*
0115 12441 000000 LINV NOP          SUBROUTINE MATRIX INVERT
0116 12442 016045 JSB LCHK2        TEST B1 FOR UNASSIGNED TERMS
0117 12443 060174 LDA B1+1        DIMENSIONS OF MATRIX B1
0118 12444 064200 LDB B3+1        DIMENSIONS OF MATRIX B3
0119 12445 016032 JSB COMPR       CHECK DIMENSIONS
0120*                                     ROW AND COL VALUES T3,T4
0121*                                     MAKE COPY OF MATRIX B1
0122*                                     IN FREE CORE
0123 12446 060177 LDA B3          SAVE
0124 12447 073127 STA T13         B3
0125 12450 060174 LDA B1+1        COMPUTE SIZE
0126 12451 015336 JSB MDIM       OF MATRIX
0127 12452 003004 CMA,INA
0128 12453 001100 ARS             SAVE
0129 12454 073114 STA T2          ELEMENT
0130 12455 001000 ALS             COUNTER
0131 12456 064141 LDB LSTPT      SAVE
0132 12457 006004 INB             ADDRESS OF
0133 12460 074175 STB B2          FREE CORE
0134 12461 074177 STB B3
0135 12462 007004 CMB,INB        COMPUTE SIZE OF
0136 12463 044142 ADB HSTPT      FREE CORE AREA
0137 12464 040001 ADA 1          ENOUGH
0138 12465 002020 SSA             CORE LEFT?
0139 12466 025473 JMP E1          NO
0140 12467 016123 JSB REPLC      YES, COPY SOURCE MATRIX
0141 12470 063127 LDA T13         RESTORE
0142 12471 070177 STA B3          B3
0143 12472 016176 JSB LIDN      SET DESTINATION TO IDENTITY
0144 12473 063127 LDA T13         RESTORE ITS
0145 12474 070177 STA B3          BASE ADDRESS
0146 12475 002400 CLA             INITIALIZE
0147 12476 073126 STA T12         MAXIMUM
0148 12477 073127 STA T13         ELEMENT
0149 12500 060175 LDA B2          COPY B2 INTO B1 AS
0150 12501 070173 STA B1          B2 NEEDED LATER
0151 12502 160173 LIN11 LDA B1,I LOAD
0152 12503 034173 ISZ B1          NEXT
0153 12504 164173 LDB B1,I       ELEMENT
0154 12505 034173 ISZ B1
0155 12506 002020 SSA            GET ABSOLUTE VALUE
0156 12507 015423 JSB ARINV     IF NUMBER IS NEGATIVE
0157 12510 073132 STA T18         SAVE NUMBER
0158 12511 077133 STB T19

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PAGE 0145 #11 MATRIX ROUTINES

0159	12512	114237	JSB .FSBA,I	SUBTRACT EXISTING MAX.
0160	12513	013126	DEF T12	VALUE
0161	12514	002020	SSA	SKIP AND SWAP IF POSITIVE
0162	12515	026522	JMP LIN1W	
0163	12516	063132	LDA T18	SWAP
0164	12517	067133	LDB T19	
0165	12520	073126	STA T12	
0166	12521	077127	STB T13	
0167	12522	037114	LIN10 ISZ T2	ALL ELEMENTS EXHAUSTED?
0168	12523	026502	JMP LIN11	NO
0169	12524	063126	LDA T12	COMPUTE RELATIVE TOLERANCE
0170	12525	067127	LDB T13	TOL=ABSOLUTE TOL * MAX VALUE
0171	12526	114240	JSB .FMPA,I	
0172	12527	015130	DEF T16	ABSOLUTE TOLERANCE
0173	12530	070171	STA MLBX1	RELATIVE
0174	12531	074172	STB MLBX1+1	TOLERANCE
0175	12532	002400	CLA	INITIALIZE PIVOT
0176	12533	073134	STA LPIV	
0177	12534	037116	ISZ T4	REQUIRE CONSTANT (ROW+1)
0178	12535	037134	LINV1 ISZ LPIV	SELECT NEXT PIVOT
0179	12536	063134	LDA LPIV	TEST IF HAVE PROCESSED
0180	12537	053116	CPA T4	LAST PIVOT
0181	12540	126441	JMP LINV,I	NORMAL EXIT TO MAIN PROG
0182*				SCAN PIVOTAL COLUMN FOR
0183*				LARGEST ELEMENT
0184	12541	063134	LDA LPIV	COMPUTE ADDRESS OF PIVOT
0185	12542	067134	LDB LPIV	COLUMN USING ROUTINE LWHR
0186	12543	073114	STA T2	ROW COUNTER
0187	12544	017067	JSB LWHR	ON RETURN, ADDRESS IN A
0188	12545	073113	STA T1	
0189	12546	002400	CLA	
0190	12547	073126	STA T12	T12,T13 IS STORE
0191	12550	073127	STA T13	FOR GREATEST VALUE
0192	12551	016230	LINV2 JSB .DLD	LOAD FP NUMBER
0193	12552	113113	DEF T1,I	
0194	12553	002020	SSA	OBTAIN ABSOLUTE VALUE
0195	12554	015423	JSB ARINV	IF NUMBER IS NEGATIVE
0196	12555	073132	STA T18	STORE VALUE OF FP NUMBER
0197	12556	077133	STB T19	
0198	12557	114237	JSB .FSBA,I	SUBTR EXISTING LARGEST VALUE
0199	12560	013126	DEF T12	
0200	12561	002020	SSA	SKIP AND SWAP IF POSITIVE
0201	12562	026571	JMP LINV7	T2 STILL CONTAINS MAX VALUE
0202	12563	063132	LDA T18	STORE NEW MAX VALUE
0203	12564	067133	LDB T19	
0204	12565	073126	STA T12	
0205	12566	077127	STB T13	
0206	12567	063114	LDA T2	SET T5 TO POSITION IN
0207	12570	073117	STA T5	COLUMN OF MAX VALUE
0208	12571	037114	LINV7 ISZ T2	TEST FOR LAST TERM IN COL
0209	12572	063114	LDA T2	
0210	12573	053116	CPA T4	SWAP ROWS
0211	12574	026602	JMP LINV8	COMPUTE
0212	12575	063115	LDA T3	NEXT ADDRESS
0213	12576	001000	ALS	IN PIVOT
0214	12577	043113	ADA T1	

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0215	12600	073113	STA T1	COLUMN
0216	12601	026551	JMP LINV2	SELECT NEXT TERM
0217*				SWAP ROWS LPIV AND T5
0218	12602	063134	LINV8 LDA LPIV	COMPUTE ADDRESS
0219	12603	006404	CLB,INB	OF PIVOTAL ROW
0220	12604	017067	JSB LWHR	
0221	12605	073113	STA T1	ADDRESS OF PIVOTAL ROW
0222	12606	063117	LDA T5	
0223	12607	006404	CLB,INB	
0224	12610	017067	JSB LWHR	
0225	12611	073114	STA T2	ADDR OF ROW TO BE SWAPPED
0226	12612	063134	LDA LPIV	
0227	12613	006404	CLB,INB	
0228	12614	017101	JSB LWHR2	COMPUTE ADDRESS OF
0229	12615	073123	STA T9	PIVOTAL ROW IN I-MATRIX
0230	12616	073124	STA T10	
0231	12617	063117	LDA T5	KEEP COPY
0232	12620	006404	CLB,INB	
0233	12621	017101	JSB LWHR2	COMPUTE ADDR OF ROW TO
0234	12622	073125	STA T11	BE SWAPPED IN I-MATRIX
0235	12623	063115	LDA T3	
0236	12624	003004	CMA,INA	
0237	12625	073126	STA T12	COUNTER FOR TERMS IN A ROW
0238	12626	016230	LINV3 JSB .DLD	SWAP ONE ELEMENT OF ROW
0239	12627	113113	DEF T1,I	
0240	12630	073132	STA T18	
0241	12631	077133	STB T19	
0242	12632	016230	JSB .DLD	
0243	12633	113114	DEF T2,I	
0244	12634	173113	STA T1,I	
0245	12635	037113	ISZ T1	
0246	12636	177113	STB T1,I	
0247	12637	037113	ISZ T1	
0248	12640	063132	LDA T18	
0249	12641	067133	LDB T19	
0250	12642	173114	STA T2,I	
0251	12643	037114	ISZ T2	
0252	12644	177114	STB T2,I	
0253	12645	037114	ISZ T2	
0254	12646	016230	JSB .DLD	SWAP ONE ELEMENT IN A ROW
0255	12647	113123	DEF T9,I	OF I-MATRIX
0256	12650	073132	STA T18	
0257	12651	077133	STB T19	
0258	12652	016230	JSB .DLD	
0259	12653	113125	DEF T11,I	
0260	12654	173123	STA T9,I	
0261	12655	037123	ISZ T9	
0262	12656	177123	STB T9,I	
0263	12657	037123	ISZ T9	
0264	12660	063132	LDA T18	
0265	12661	067133	LDB T19	
0266	12662	173125	STA T11,I	
0267	12663	037125	ISZ T11	
0268	12664	177125	STB T11,I	
0269	12665	037125	ISZ T11	
0270	12666	037126	ISZ T12	SKIP IF DONE

0271	12667 026626	JMP LINV3	SWAP NEXT ELEMENT
0272*			HAVE LARGEST ELEMENT IN
0273*			PIVOTAL POSITION. FIND
0274*			VALUE AND TEST TO ZERO
0275*			FOR SINGULAR MATRIX
0276	12670 063134	LDA LPIV	COMPUTE
0277	12671 067134	LDB LPIV	ADDRESS OF
0278	12672 017067	JSB LWHR	PIVOT
0279	12673 073113	STA T1	ELEMENT
0280	12674 016230	JSB .DLD	PIVOT VALUE
0281	12675 113113	DEF T1,I	
0282	12676 002020	SSA	OBTAIN ABSOLUTE VALUE
0283	12677 015423	JSB ARINV	IF NUMBER IS NEGATIVE
0284	12700 114237	JSB .F8BA,I	SUBTRACT TOLERANCE AND
0285	12701 000171	DEF MLBX1	
0286	12702 002020	SSA	COMPARE TO ZERO
0287	12703 014477	JSB ERROR	PRINT 'NEARLY SING MATRIX'
0288*			DIVIDE PIVOT ROW AND ROW
0289*			IN I-MAT BY PIVOT VALUE
0290	12704 063113	LDLM1 LDA T1	ADDRESS OF PIOT ELEMENT
0291	12705 073114	STA T2	
0292	12706 060466	LDA HONE	LOAD
0293	12707 064325	LDB .2	1.0
0294	12710 114241	JSB .FDVA,I	
0295	12711 113113	DEF T1,I	
0296	12712 073132	STA T18	INVERSE OF PIVOT
0297	12713 077133	STB T19	
0298*			MULT ROW BY 1/PIVOT
0299*			STARTING AT PIVOT+1
0300	12714 063134	LDA LPIV	
0301	12715 073125	STA T11	COUNTER FOR ROW
0302	12716 037125	LINV6 ISZ T11	INCREMENT COUNTER
0303	12717 063125	LDA T11	
0304	12720 053116	CPA T4	TEST FOR END OF ROW
0305	12721 026733	JMP LIN12	
0306	12722 037114	ISZ T2	ADDRESS OF NEXT ELEMENT
0307	12723 037114	ISZ T2	
0308	12724 016230	JSB .DLD	
0309	12725 113114	DEF T2,I	
0310	12726 114240	JSB .FMPA,I	
0311	12727 013132	DEF T18	
0312	12730 016240	JSB .DST	
0313	12731 113114	DEF T2,I	
0314	12732 026716	JMP LINV6	
0315*			MULT ROW IN I-MATRIX BY
0316*			1/PIVOT. SKIP IF ELEMENT=0
0317	12733 063124	LIN12 LDA T10	ADDRESS OF PIVOT ROW
0318	12734 073117	STA T5	IN I-MATRIX
0319	12735 063115	LDA T3	
0320	12736 003004	CMA,INA SET	
0321	12737 073125	STA T11	ROW COUNTER
0322	12740 016230	LIN13 JSB .DLD	
0323	12741 113117	DEF T5,I	
0324	12742 002003	SZA,RSS	SKIP MULTIPLICATION IF ZERO
0325	12743 006002	SZB	
0326	12744 026746	JMP *+2	NOT ZERO

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0327	12745	026752	JMP LIN14	ZERO
0328	12746	114240	JSB .FMPA,I	
0329	12747	013132	DEF T18	
0330	12750	016240	JSB .DST	
0331	12751	113117	DEF T5,I	
0332	12752	037117	LIN14 ISZ T5	NEXT ELEMENT IN I-MATRIX
0333	12753	037117	ISZ T5	
0334	12754	037125	ISZ T11 DONE?	
0335	12755	026740	JMP LIN13	NO
0336*				PERFORM ROW MANIPULATIONS
0337*				AND SUBTRACTIONS TO REDUCE
0338*				PIVOT COLUMN TO ZERO
0339	12756	002400	CLA	
0340	12757	070173	STA B1	
0341	12760	034173	LINV4 ISZ B1	SELECT NEXT ROW
0342	12761	060173	LDA B1	
0343	12762	053116	CPA T4	TEST FOR LAST ROW
0344	12763	026535	JMP LINV1	SELECT NEXT PIVOT
0345	12764	053134	CPA LPIV	TEST TO SKIP PIVOTAL ROW
0346	12765	026760	JMP LINV4	SKIP PIVOTAL ROW
0347	12766	060173	LDA B1	
0348	12767	006404	CLB,INB	
0349	12770	017101	JSB LWHR2	ADDRESS OF ROW TO BE TRANSFORMED
0350	12771	073125	STA T11	IN I-MATRIX
0351*				COMPUTE MULTIPLIER WHICH
0352*				IS THAT ELEMENT IN ROW TO
0353*				BE TRANSFORMED WHICH LIES
0354*				IN THE PIVOTAL COLUMN
0355	12772	060173	LDA B1	
0356	12773	067134	LDB LPIV	
0357	12774	017067	JSB LWHR	
0358	12775	073123	STA T9	SAVE ADDRESS
0359	12776	016230	JSB .DLD	
0360	12777	100000	DEF 0,I	
0361	13000	073121	STA T7	VALUE OF MULTIPLIER
0362	13001	077122	STB T8	
0363*				DO ELIMINATION OF ROWS IN
0364*				ORIGINAL MATRIX. START AT
0365*				COLUMN LPIV+1
0366	13002	063134	LDA LPIV	
0367	13003	073127	STA T13	COUNTER
0368	13004	063113	LDA T1	
0369	13005	073114	STA T2	
0370	13006	037127	LINV5 ISZ T13	
0371	13007	063127	LDA T13	
0372	13010	053116	CPA T4	TEST FOR LAST TERM IN ROW
0373	13011	027033	JMP LIN15	
0374	13012	037123	ISZ T9	T9 IS ADDRESS OF
0375	13013	037123	ISZ T9	ELEMENT TO BE CHANGED
0376	13014	037114	ISZ T2	T2 IS ADDR OF CORRESPONDING
0377	13015	037114	ISZ T2	ELEMENT IN PIVOTAL ROW
0378	13016	063121	LDA T7	
0379	13017	067122	LDB T8	
0380	13020	114240	JSB .FMPA,I	
0381	13021	113114	DEF T2,I	
0382	13022	073132	STA T18	MULTIPLIER*VALUE IN

PAGE 0149 #11 MATRIX ROUTINES

0383	13023	077133	STB T19	PIVOT ROW
0384	13024	016230	JSB .DLD	
0385	13025	113123	DEF T9,I	
0386	13026	114237	JSB .FSBA,I	
0387	13027	013132	DEF T18	
0388	13030	016240	JSB .DST	TRANSFORMED ELEMENT
0389	13031	113123	DEF T9,I	
0390	13032	027006	JMP LINV5	SELECT NEXT TERM
0391*				DO ELIMINATION OF ROWS IN
0392*				IDENTITY MATRIX. START AT
0393*				BEGINNING OF ROW AND LEAVE
0394*				ELEMENT UNCHANGED WHEN ZERO
0395*				IN PIVOTAL ROW.
0396	13033	063124	LIN15 LDA T10	ADDRESS OF
0397	13034	073117	STA T5	PIVOTAL ROW
0398	13035	063115	LDA T3	
0399	13036	003004	CMA,INA	SET
0400	13037	073127	STA T13	COUNTER
0401	13040	163117	LIN18 LDA T5,I	
0402	13041	037117	ISZ T5	
0403	13042	167117	LDB T5,I	
0404	13043	037117	ISZ T5	
0405	13044	002003	SZA,RSS	SKIP IF ZERO
0406	13045	006002	SZB	
0407	13046	027050	JMP *+2	NOT ZERO
0408	13047	027062	JMP LIN17	ZERO
0409	13050	114240	JSB .FMPA,I	MULTIPLY BY
0410	13051	013121	DEF T7	MULTIPLIER
0411	13052	073132	STA T18	
0412	13053	077133	STB T19	
0413	13054	016230	JSB .DLD	
0414	13055	113125	DEF T11,I	
0415	13056	114237	JSB .FSBA,I	
0416	13057	013132	DEF T18	
0417	13060	016240	JSB .DST	
0418	13061	113125	DEF T11,I	
0419	13062	037125	LIN17 ISZ T11	
0420	13063	037125	ISZ T11	
0421	13064	037127	ISZ T13	
0422	13065	027040	JMP LIN18	SELECT NEXT TERM
0423	13066	026760	JMP LINV4	ELIMINATE NEXT ROW
0424*				
0425*				
0426*****				*****
0427*****				SUBROUTINE LWHR *****
0428*****				*****
0429*SUBROUTINE COMPUTES ADDRESS OF AN ELEMENT *				
0430*IN MATRIX GIVEN BY B2. ROW AND COL VALUES *				
0431*ARE SUPPLIED IN A,B. ADDRESS IS LEFT IN A *				
0432*ENTRY LWHR2 COMPUTES ADDR IN MAT B3 *				
0433*****				*****
0434*				
0435	13067	000000	LWHR NOP	
0436	13070	077121	STB T7	SAVE COLUMN #
0437	13071	040431	ADA M1	
0438	13072	015236	JSB MPY	

PAGE 0150 #11 MATRIX ROUTINES

0439	13073	013115	DEF T3	(A-1)*T3
0440	13074	043121	ADA T7	
0441	13075	040431	ADA M1	+ (B-1)
0442	13076	001000	ALS	
0443	13077	040175	ADA B2	DDR=B2+2((A-1)*T3+(B-1))
0444	13100	127067	JMP LWHR,I	
0445	13101	000000	LWFR2 NOP	
0446	13102	077121	STB T7	
0447	13103	040431	ADA M1	
0448	13104	015236	JSB MPY	
0449	13105	013115	DEF T3	
0450	13106	043121	ADA T7	
0451	13107	040431	ADA M1	
0452	13110	001000	ALS	
0453	13111	040177	ADA B3	
0454	13112	127101	JMP LWHR2,I	

9455

9456*

0458* CONSTANTS

0460*

0461	13113	000000	T1	BSS	1	TEMPORARY CONSTANTS
0462	13114	000000	T2	BSS	1	
0463	13115	000000	T3	BSS	1	
0464	13116	000000	T4	BSS	1	
0465	13117	000000	T5	BSS	1	
0466	13120	000000	T6	BSS	1	
0467	13121	000000	T7	BSS	1	
0468	13122	000000	T8	BSS	1	
0469	13123	000000	T9	BSS	1	
0470	13124	000000	T10	BSS	1	
0471	13125	000000	T11	BSS	1	
0472	13126	000000	T12	BSS	1	
0473	13127	000000	T13	BSS	1	
0474	13130	041433	T16	DEC +1E-6		ABSOLUTE TOLERANCE
0475	13132	000000	T18	BSS	1	
0476	13133	000000	T19	BSS	1	
0477	13134	000000	LPIV	BSS	1	
0478	13135	114236	LPLUS	JSB .FADA,I		GENERATES CODE
0479	13136	100175		DEF B2,I		
0480	13137	114237	LMIN	JSB .FSBA,I		GENERATES CODE
0481	13140	114240	LTIME	JSB .FMPA,I		GENERATES CODE
0482	13141	034175	INCB2	ISZ B2		GENERATES CODE
0483	13142		FINIS	EQU *		
0484				END		

** NO ERRORS *

**PREPARE BASIC SYSTEM
(REV. A)**

BINARY TAPE	20392-60002
SOURCE TAPES	20392-80012
	20392-80013
	20392-80014
SOURCE LISTING	20392-90002

PAGE 0001

0001
** NO ERRORS*

ASMB,A,B,L

PREPARE BASIC SYSTEM--JANUARY 1, 1970

PAGE 0002 #01 BASIC SYSTEM CONFIGURATOR

0001 ASMB,A,B,L PREPARE BASIC SYSTEM--JANUARY 1, 1970
 0003 00002 ORG 2

0004*
 0005* THIS PROGRAM WILL CONFIGURE AND PUNCH AS AN ABSOLUTE TAPE THE
 0006* HP BASIC SYSTEM COMPATIBLE WITH 'BOSS'; INCLUSION OF THE 'BOSS'
 0007* VERSION OF THE BASIC INTERPRETER IS OPTIONAL. TELETYPE,
 0008* PHOTOREADER, AND PUNCH DRIVERS ARE SUPPLIED BY THIS PROGRAM.
 0009* CUSTOM 'CALL' Routines MAY BE INCLUDED IF THE BASIC INTERPRETER
 0010* IS PRESENT. OPTIONS INCLUDE CHOICE OF BUFFERED OR SERIAL
 0011* TELETYPE AND CONFIGURATION FOR 8, 16, 24, OR 32K OF
 0012* MEMORY.

0013*
 0014* THE AREAS PUNCHED ARE 4 THROUGH 'CONTENTS OF FWAM' -1 AND
 0015* 'CONTENTS OF LWAM' +1 THROUGH 'CONTENTS OF LWM'; I.E., SYSTEM
 0016* CODE AND DRIVER CODE.

0017*
 0018* TU OPERATE -

0019*
 0020* 1) LOAD THE PBS TAPE WITH THE PROTECTED LOADER.
 0021* 2) (OPTIONAL) LOAD BASIC INTERPRETER ('CALL ROUTINES
 0022* MAY ALSO BE LOADED IF DESIRED).
 0023* 3) 'LOAD ADDRESS' 2 AND 'RESET'.
 0024* 4) SET SELECT CODE OF TELETYPE (IN OCTAL) INTO THE
 0025* SWITCH REGISTER. SET SWITCH 15 TO 1 IF USING A
 0026* SERIAL TELETYPE BOARD.
 0027* 5) SET TELETYPE TO 'LINE,' TURN ON HIGH-SPEED TAPE PUNCH
 0028* IF PRESENT, AND PRESS 'RUN'.
 0029* 6) ANSWER TELETYPE REQUESTS APPROPRIATELY.
 0030* 7) AFTER THE FLT 778, PRESS 'RUN' FOR EXTRA COPIES.

0031*
 0032 SUP SUPPRESS LISTING OF MULTIPLE OPERANDS
 0033*
 0034 00002 124003 JMP 3,I BEGIN
 0035 00003 016333 DEF START EXECUTION

0036*
 0037 00004 103004 HLT 4,C IN CASE OF POWER FAIL
 0038 00005 102005 HLT 5 IN CASE OF PARITY FAULT
 0039 00006 000000 OCT 0,0,0,0,0,0,0,0,0 NOP ALL MAIN-FRAME
 0040 00017 000000 OCT 0,0,0,0,0,0,0,0,0 INTERRUPT LOCATIONS

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0042	16333	ORG 16333B	
0043*			
0044	16333 107700	START CLC 0,C	TURN OFF INTERRUPT, ALL DEVICES
0045	16334 102501	LIA 1	LOAD FROM SWITCH REGISTER
0046	16335 001623	ELA,RAR	PUT A(15) INTO (E)
0047	16336 013223	AND B77	MASK TO 6 BITS
0048	16337 073244	STA IOADR	SAVE I/O ADDRESS
0049	16340 001121	ARS,ARS	SHIFT OUT FIRST OCTAL DIGIT
0050	16341 001100	ARS	
0051	16342 002002	SZA	IS I/O ADDRESS GT 7
0052	16343 026346	JMP GOMAN	YES THEN OK
0053*			
0054	16344 102055	HLT 55B	INVALID TTY ADDRESS HALT
0055	16345 026334	JMP START+1	TRY AGAIN
0056*			
0057*	SET TELETYPE I/C INSTRUCTION ADDRESSES		
0058*			
0059	16346 002040	GOMAN SEZ	BUFFERED TELETYPE?
0060	16347 127240	JMP SERLA,I	NO
0061	16350 063210	LDA M24	YES, LOAD # OF INSTRUCTIONS
0062	16351 067301	LDB LST1A	ADDRESS OF INSTRUCTION LIST
0063	16352 016646	JSB SETI	SET TTY I/O ADDRESSES
0064*			
0065*	CALL FOR PHOTUREADER ADDRESS INPUT		
0066*			
0067	16353 016642	PHRDR JSB CRLFU	DO A CR/LF
0068	16354 063206	LDA M27	MESSAGE LENGTH, NEGATIVE NO CRLF
0069	16355 067056	LDB MA1	MESSAGE ADDRESS
0070	16356 015571	JSB GETAU	GET ADDRESS
0071	16357 026371	JMP NORDR	ADDRESS =0, NO READER
0072	16360 063214	LDA M5	VALID READER ADDRESS
0073	16361 067310	LDB LST2A	READER INSTRUCTION ADDRESS LIST
0074	16362 016646	JSB SETI	SET READER I/O INSTRUCTIONS
0075	16363 063307	LDA R0	SET CLC RDR
0076	16364 073524	PHRD1 STA R.OFF	INSTRUCTION
0077	16365 063247	LDA LWAMR	
0078	16366 070111	STA LWAM	SET LAST WORD AVAILABLE MEMORY
0079	16367 002004	INA	
0080	16370 070101	STA 101B	SET READER LINK
0081*			
0082*	CALL FOR PUNCH ADDRESS INPUT		
0083*			
0084	16371 016642	NORDR JSB CRLFU	
0085	16372 063211	LDA M20	
0086	16373 067075	LDB MA2	
0087	16374 016571	JSB GETAU	CALL FOR PUNCH ADDRESS INPUT
0088	16375 026407	JMP SYSDP	NO PUNCH
0089	16376 063214	LDA M5	VALID PUNCH ADDRESS
0090	16377 067317	LDB LST3A	PUNCH INSTRUCTION ADDRESS LIST
0091	16400 016646	JSB SETI	SET PUNCH I/O INSTRUCTIONS
0092	16401 063316	LDA PO	SET CLC PNCH
0093	16402 073525	NORD1 STA P.OFF	INSTRUCTION
0094	16403 063250	LDA LWAMP	
0095	16404 070111	STA LWAM	SET LWAM
0096	16405 002004	INA	
0097	16406 070103	STA 103B	SET PUNCH LINK

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0098*

0099* CALL FOR DUMP DEVICE ADDRESS

0100*

0101	16407	016642	SYSDP	JSB CRLF0	CR/LF
0102	16410	063207		LDA M25	
0103	16411	067143		LDB MA5	
0104	16412	016571		JSB GETAD	GET DUMP I/O ADDRESS
0105	16413	026421		JMP CURAD	NO SYSTEM DUMP DEVICE AVAILABLE
0106	16414	063215		LDA CM.4	SYSTEM DUMP DEVICE AVAILABLE
0107	16415	067324		LDB LST4A	SET DEVICE'S I/O INSTRUCTIONS
0108	16416	016646		JSB SETI	
0109	16417	063246		LDA PNCHI	SET PUNCH OUTPUT TO REFERENCE
0110	16420	073245		STA PNCHO	HIGH SPEED PUNCH ROUTINE

0111*

0112* CALL FOR CORE SIZE

0113*

0114	16421	016642	CORAD	JSB CRLF0	
0115	16422	063213		LDA M12	REQUEST
0116	16423	067161		LDB MA6	
0117	16424	017445	CORA1	JSB TTY.P	CORE
0118	16425	063221		LDA .20	
0119	16426	067010		LDB BUF	SIZE
0120	16427	000000	CORA2	NOP	
0121	16430	017426		JSB TTY.I	
0122	16431	000000		NOP	
0123	16432	002003		SZA,RSS	NULL ANSWER?
0124	16433	026532		JMP DUMP	YES, ASSUME 8K
0125	16434	163010		LDA BUF,I	NO
0126	16435	053227		CPA C8K	'8 NULL'?
0127	16436	026532		JMP DUMP	YES
0128	16437	006400		CLB	NO
0129	16440	053230		CPA C16K	'16'?
0130	16441	026455		JMP RELOC	YES
0131	16442	006004		INB	NO
0132	16443	053231		CPA C24K	'24'?
F133	16444	026455		JMP RELOC	YES
0134	16445	006004		INB	NO
0135	16446	053232		CPA C32K	'32'?
0136	16447	026455		JMP RELOC	YES
0137	16450	016642		JSB CRLF0	NO
0138	16451	063212		LDA M15	
0139	16452	067170		LDB MA7	PRINT
0140	16453	017445	CORA3	JSB TTY.P	ERROR
0141	16454	026421		JMP CORAD	TRY AGAIN

0143*
 0144* RELOCATE DRIVERS
 0145*
 0146 16455 047233 RELOC ADB INCIN LOAD
 0147 16456 164001 LDB 1,I DISPLACEMENT
 0148 16457 063237 LDA LWM ADJUST
 0149 16460 040001 ADA 1
 0150 16461 073237 STA LWM ABSOLUTE
 0151 16462 063672 LDA CRLFA
 0152 16463 040001 ADA 1 POINTERS
 0153 16464 073672 STA CRLFA
 0154 16465 060101 LDA 101B
 0155 16466 040001 ADA 1
 0156 16467 002021 SSA,RSS
 0157 16470 070101 STA 101B
 0158 16471 060102 LDA 102B
 0159 16472 040001 ADA 1
 0160 16473 070102 STA 102B
 0161 16474 060103 LDA 103B
 0162 16475 040001 ADA 1
 0163 16476 002021 SSA,RSS
 0164 16477 070103 STA 103B
 0165 16500 060104 LDA 104B
 0166 16501 040001 ADA 1
 0167 16502 070104 STA 104B
 0168 16503 060111 LDA LWAM
 0169 16504 073241 STA SOURC SAVE ADDRESS OF DRIVER MODULE
 0170 16505 040001 ADA 1
 0171 16506 070111 STA LWAM
 0172 16507 073242 STA DEST SET DESTINATION ADDRESS
 0173 16510 060123 LDA IMOFF
 0174 16511 040001 ADA 1
 0175 16512 070123 STA IMOFF
 0176 16513 060124 LDA IMON
 0177 16514 040001 ADA 1
 0178 16515 070124 STA IMON
 0179 16516 060125 LDA TLINK
 0180 16517 040001 ADA 1
 0181 16520 070125 STA TLINK
 0182 16521 067237 LDB LWM COMPUTE
 0183 16522 007004 CMB,INB # OF WORDS
 0184 16523 044111 ADB LWAM TO BE MOVED
 0185 16524 037241 MOREM ISZ SOURC ADVANCE
 0186 16525 037242 ISZ DEST POINTERS
 0187 16526 163241 LDA SOURC,I MOVE A
 0188 16527 173242 STA DEST,I WORD
 0189 16530 006006 INB,SZB DONE?
 0190 16531 026524 JMP MOREM NO

0192*

0193* THIS SECTION DUMPS THE ELEMENTS OF THE SYSTEM LOADED

0194*

0195	16532	016642	DUMP	JSB CRLFU	
0196	16533	060111	LDA LWAM	SET STARTING	
0197	16534	043204	ADA M36	ADDRESS FOR	
0198	16535	070131	STA IOBFA	I/O BUFFER	
0199	16536	070117	STA SYMTA	SET SYMBOL TABLE POINTER	
0200	16537	043203	ADA M97	SET STARTING ADDRESS	
0201	16540	070134	STA SBUFA	FOR SYNTAX BUFFER	
0202	16541	043216	ADA M1		
0203	16542	070111	STA LWAM	SAVE VALUE CORRECTED FOR BUFFERS	
0204	16543	070106	STA LWBM	FOR STAND-ALONE OPERATION	
0205	16544	063245	LDA PNCHO		
0206	16545	053246	CPA PNCHI	SYSTEM DUMP DEVICE AVAILABLE?	
0207	16546	026555	JMP COPY	PUNCH IS AVAILABLE	
0208*					
0209	16547	063222	LDA .30		
0210	16550	067110	LDB MA3		
0211	16551	017445	DUMP1 JSB TTY.P	REQUEST TTY PUNCH ON	
0212*					
0213	16552	060126	DUMP2 LDA PLSTR	PREPARE TO	
0214	16553	070127	STA LISTR	PUNCH	
0215	16554	102011	HLT 11B		
0216*					
0217	16555	017004	COPY JSB LTG	GENERATE LEADER	
0218	16556	063220	LDA .4	DUMP	
0219	16557	007400	CCB	LOCATIONS 4	
0220	16560	044110	ADB FWAM	THROUGH	
0221	16561	016734	JSB PNCHA	(FWAM)-1	
0222	16562	060111	LDA LWAM	DUMP	
0223	16563	043224	ADA .135	DRIVER	
0224	16564	067237	LDB LWM	AREA	
0225	16565	016734	JSB PNCHA		
0226	16566	017004	JSB LTG	GENERATE TRAILER	
0227	16567	102077	HLT 77B	END OF DUMP ROUTINE	
0228	16570	026555	JMP COPY	GO MAKE ANOTHER COPY	

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0230*
 0231* SUBROUTINE GETAI
 0232*
 0233* THIS SUBROUTINE CALLS FOR I/O ADDRESS INPUT, PROCESSES THE
 0234* INPUT AND IF INPUT VALID RETURNS TO P+2. IF NOTHING IS
 0235* INPUTTED IT RETURNS TO P+1 WITH LINK TO STOP IN A
 0236*
 0237* CALL: JSB GETAD
 0238* (A) = LENGTH OF MESSAGE ASKING FOR I/O ADDRESS
 0239* (B) = ADDRESS OF MESSAGE
 0240*
 0241* RETURN: ZERO INPUT - P+1 (A) = LINK TO STOP
 0242* VALID ADDRESS - P+2 (A) = I/O ADDRESS
 0243*
 0244* I/O ADDRESS IS SAVED IN LOCATION IOADR
 0245*
 0246* IF INPUT IS INVALID (IE NOT TWO NUMBERS 10-77)
 0247* "INVALID I/O ADDRESS" IS TYPED AND IT WAITS
 0248* FOR FURTHER INPUT.
 0249*
 0250 16571 0000000 GETAD NOP
 0251 16572 017445 JSB TTY.P PRINT INPUT REQUEST MESSAGE
 0252 16573 063221 INPUT LDA .20
 0253 16574 067010 LDB BUF
 0254 16575 0000000 GETA1 NOP WAIT
 0255 16576 017426 JSB TTY.I FOR
 0256 16577 0000000 NOP INPUT
 0257 16600 0020003 SZA,RSS ANY ADDRESS?
 0258 16601 126571 JMP GETAU,I NO ADDRESS
 0259 16602 053656 CPA .2 TWO CHARACTERS INPUT?
 0260 16603 026612 JMP TWOCH TWO CHARACTERS INPUTTED
 0261*
 0262 16604 016642 ERRO. JSB CRLFD INVALID INPUT ERROR
 0263 16605 063221 LDA .20
 0264 16606 067130 LDB MA4
 0265 16607 017445 GETA2 JSB TTY.P PRINT 'INVALID INPUT'
 0266 16610 016642 JSB CRLFD DO A RETURN AND LINE FEED
 0267 16611 026573 JMP INPUT RETURN FOR MORE INPUT
 0268*
 0269 16612 163010 TWCCH LDA BUF,I GET FIRST TWO CHARACTERS
 0270 16613 001727 ALF,ALF LOOK AT FIRST CHARACTER
 0271 16614 016631 JSB NBER CHECK FOR VALID OCTAL;YES,CONVRT
 0272 16615 026604 JMP ERRO. NOT OCTAL
 0273 16616 0020003 SZA,RSS ADDRESS > 7 ?
 0274 16617 026604 JMP ERRO. NO
 0275 16620 001723 ALF,RAR MOVE FIRST DIGIT 3 BITS LEFT
 0276 16621 073244 STA IOADR AND SAVE
 0277 16622 163010 LDA BUF,I
 0278 16623 016631 JSB NBER CHECK SECOND CHARACTER
 0279 16624 026604 JMP ERRO. NOT OCTAL
 0280 16625 033244 IOR IOADR FORM TWO DIGIT OCTAL NUMBER
 0281 16626 073244 STA IOADR SAVE I/O ADDRESS
 0282 16627 036571 ISZ GETAD NON-ZERO I/O ADDRESS
 0283 16630 126571 JMP GETAD,I RETURN

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0285*
0286* SUBROUTINE NBER
0287*
0288* THIS SUBROUTINE CHECKS WHETHER THE CHARACTER IN A REPRESENTS
0289* A VALID OCTAL DIGIT. IF THE CHARACTER IS VALID IT IS
0290* CONVERTED TO AN OCTAL DIGIT.
0291*
0292* RETURN: P+1 INVALID OCTAL CHARACTER
0293* P+2 VALID OCTAL CHARACTER
0294* (A) = OCTAL DIGIT
0295*
0296*
0297 16631 000000 NBER NOP
0298 16632 013666 AND B177 MASK TO ONE CHARACTER
0299 16633 043205 ADA N60 SUBTRACT OCTAL 60
0300 16634 070001 STA 1 TRANSFER TO B
0301 16635 005121 BRS,BRS
0302 16636 005100 BRS SHIFT OUT FIRST 3 BITS
0303 16637 006003 SZB,RSS IS B ZERO
0304 16640 036631 ISZ NBER B=0, VALID DIGIT, RETURN TO P+2
0305 16641 126631 JMP NBER,I RETURN

0307*
0308* SUBROUTINE CRLF0 OUTPUTS A CARRIAGE RETURN AND LINE FEED.
0309*
0310 16642 000000 CRLF0 NOP EXIT/ENTRY
0311 16643 002400 CLA
0312 16644 017445 CRLF1 JSB TTY.P DO CR/LF
0313 16645 126642 JMP CRLF0,I EXIT

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0315*
0316* SUBROUTINE SETI
0317*
0318* THIS SUBROUTINE MODIFIES THE ADDRESSES SPECIFIED IN A LIST
0319*
0320* CALL: JSB SETI
0321* (A) = NUMBER OF LOCATIONS TO BE MODIFIED (2'S COMP)
0322* (B) = STARTING ADDRESS OF LIST OF ADDRESSES
0323*
0324*
0325 16646 000000 SETI NOP EXIT/ENTRY
0326 16647 073676 STA COUNT SAVE LENGTH OF LIST
0327 16650 077675 STB BADDR SET LIST STARTING ADDRESS
0328 16651 167675 LOCP LDB BADDR,I LOAD ADDRESS OF INSTRUCTION
0329 16652 160001 LDA 1,I LOAD INSTRUCTION TO BE MODIFIED
0330 16653 013201 AND MASK ZERO I/O PART, MASK=177700
0331 16654 033244 IOR IOADR INSERT I/O ADDRESS
0332 16655 170001 STA 1,I SET MODIFIED INSTRUCTION
0333 16656 037675 ISZ BADDR INDEX LIST POINTER
0334 16657 037676 ISZ COUNT
0335 16660 026651 JMP LOOP GO DO NEXT LOCATION
0336 16661 126646 JMP SETI,I RETURN

0338*
0339* SUBROUTINE (TOUT) TO OUTPUT ONE CHARACTER
0340* TO TELETYPE. CHARACTER IS IN (A). (B) IS NOT ALTERED.
0341*
0342 16662 000000 TOLT NOP
0343 16663 102600 TP.11 OTA TTY LOAD BOARD BUFFER
0344 16664 103700 STC TTY,C GIVE PUNCH COMMAND
0345 16665 102300 SFS TTY WAIT FOR
0346 16666 026665 JMP *=1 COMPLETION
0347 16667 126662 JMP TOUT,I

0349*
0350* SUBROUTINE (POUT) TO OUTPUT ONE CHARACTER TO
0351* PUNCH DEVICE. CHARACTER IS IN (A). (B) IS NOT ALTERED.
0352*
0353 16670 000000 POLT NOP
0354 16671 102600 OTA PNCH FILL BOARD BUFFER
0355 16672 103700 STC PNCH,C REQUEST PUNCH
0356 16673 102300 SFS PNCH WAIT UNTIL
0357 16674 026673 JMP *=1 DONE
0358 16675 126670 JMP POUT,I

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0360*
 0361* SUBROUTINE PUNCH
 0362*
 0363* THIS SUBROUTINE PROVIDES THE MEANS OF PUNCHING BINARY
 0364* RECORDS ON THE TELETYPE OR HIGH SPEED PUNCH.
 0365*
 0366* CALLING SEQUENCE JSB PUNCH
 0367*
 0368* (A) = LENGTH (AND MODE) OF RECORD TO BE OUTPUT
 0369* (B) = STARTING ADDRESS OF DATA BUFFER
 0370*
 0371* BINARY OUTPUT IS INDICATED BY A NEGATIVE (2'S COMPLE-
 0372* MENT) VALUE IN A. THIS NEGATIVE VALUE IS THE
 0373* NUMBER OF WORDS TO BE OUTPUT.
 0374*
 0375* IF A = 0 ON ENTRY 10 INCHES OF FEED FRAMES ARE PUNCHED
 0376*
 0377 16676 000000 PUNCH NOP EXIT/ENTRY
 0378 16677 077050 STB BUFF SAVE STARTING ADDRESS OF BUFFER
 0379 16700 067515 LDB PMODE
 0380 16721 106600 TP.9 OTB TTY SET TTY TO PUNCH MODE
 0381 16702 002002 SZA CHECK FOR FEED FRAMES ONLY
 0382 16703 026706 JMP *+3 NOT FEED FRAME MODE
 0383 16704 063202 LDA .200
 0384 16705 026724 JMP PP03+1 DO FEED FRAMES ONLY
 0385*
 0386 16706 001000 ALS CONVERT COUNT TO CHARACTERS (X2)
 0387 16707 073243 STA CHC1 AS COUNTER FOR OUTPUT SECTION.
 0388 16710 067226 LDB UL52 SET UPPER/LOWER INDICATOR
 0389*
 0390* CHARACTER OUTPUT SECTION
 0391*
 0392 16711 163050 PP02 LDA BUFF,I GET WORD CONTAINING CHARACTER
 0393 16712 006021 SSB,RSS IF UPPER/LOWER FLAG SAYS UPPER
 0394 16713 001727 ALF,ALF (SIGN = 0) ROTATE TO LOWER
 0395 16714 013225 AND M377 REMOVE UPPER CHARACTER
 0396 16715 117245 JSB PNCHO,I OUTPUT CHARACTER
 0397 16716 006020 SSB IF CHAR. OUTPUT WAS LOWER CHAR.,
 0398 16717 037050 ISZ BUFF ADD 1 TO BUFFER ADDRESS.
 0399 16720 005200 RBL SET UPPER/LOWER FLAG FOR NEXT CHA
 0400 16721 037243 ISZ CHC1 INDEX CHARACTER COUNTER,
 0401 16722 026711 JMP PP02 NOT ZERO, MORE TO OUTPUT.
 0402*
 0403* COMPLETION SECTION
 0404*
 0405 16723 063215 PP03 LDA CM.4 BINARY SECTION. SET BUFF = -4
 0406 16724 073050 STA BUFF FOR COUNTER FOR FEED-FRAMES
 0407 16725 002400 CLA SET A = ZERO(FEED-FRAME).
 0408 16726 117245 JSB PNCHO,I OUTPUT FEED FRAME
 0409 16727 037050 ISZ BUFF INDEX COUNTER
 0410 16730 026725 JMP *-3 CONTINUE OUTPUT
 0411 16731 106700 TP.10 CLC TTY TURN OFF TTY
 0412 16732 106700 PN8 CLC PNCH TURN OFF PUNCH
 0413 16733 126676 JMP PUNCH,I EXIT

0415*

0416* SUBROUTINE- PNCHA (PUNCH ABSOLUTE BLOCK)

0417*

0418* UPON ENTRY --

0419* (A) = ADDRESS OF FIRST WORD OF BLOCK

0420* (B) = ADDRESS OF LAST WORD OF BLOCK

0421*

0422	16734	000000	PNCHA	NOP	
0423	16735	006004		INB	SET = TO LAST +1M FOR EOB CHECK
0424	16736	073051		STA T1	SAVE FIRST AND LAST WORD
0425	16737	077052		STB T2	ADDRESSES OF BLOCK.
0426	16740	063206	P1	LDA M27	SET T3 = -27 AS INDEX FOR
0427	16741	073053		STA T3	FILLING BUFFER.
0428	16742	063051		LDA T1	SET BUF+1 FOR LOAD ADDRESS
0429	16743	173011		STA BUF1,I	OF CURRENT BLOCK.
0430	16744	073055		STA CKSUM	INITIALIZE CHECKSUM WORD.
0431	16745	002400		CLA	INITIALIZE
0432	16746	173010		STA BUF,I	WORD COUNT
0433	16747	063010		LDA BUF	SET T4 = ADDRESS
0434	16750	043656		ADA .2	OF WORD 3 OF BUFFER
0435	16751	073054		STA T4	FOR STORING WORDS.
0436*					
0437	16752	163051	P2	LDA T1,I	STORE CURRENT WORD FROM MEMORY
0438	16753	173054		STA T4,I	BLOCK IN BUFFER.
0439	16754	037051		ISZ T1	BUMP BLOCK ADDRESS
0440	16755	037054		ISZ T4	ADD 1 TO BUFFER ADD950J3
0441	16756	043055		ADA CKSUM	ADD WORD TO CUMULATED
0442	16757	073055		STA CKSUM	CHECKSUM
0443	16760	137010		ISZ BUF,I	COUNT WORD STORED IN BUFFER.
0444	16761	063051		LDA T1	CHECK FOR END OF BLOCK.
0445	16762	053052		CPA T2	
0446	16763	026766		JMP P3	YES, FWA = LWA.
0447	16764	037053		ISZ T3	INDEX BUFFER COUNTER.
0448	16765	026752		JMP P2	BUFFER NOT YET FILLED.
0449*					
0450	16766	063055	P3	LDA CKSUM	BUFFER FILLED, SET CHECKSUM IN
0451	16767	173054		STA T4,I	LAST WORD IN BUFFER.
0452	16770	163010		LDA BUF,I	POSITION RECORD
0453	16771	001727		ALF,ALF	WORD COUNT TO
0454	16772	173010		STA BUF,I	UPPER CHARACTER IN WORD 1.
0455	16773	001727		ALF,ALF	REPOSITION, ADD 3 FOR
0456	16774	043217		ADA C.03	TOTAL RECORD LENGTH, SET
0457	16775	003004		CMA,INA	NEGATIVE FOR OUTPUT.
0458	16776	067010		LDB BUF	(B) = ADDR. OF BUFFER.
0459	16777	016676		JSB PUNCH	PUNCH RECORD
0460*					
0461	17000	063051		LDA T1	CHECK AGAIN FOR COMPLETION OF
0462	17001	053052		CPA T2	PUNCHING BLOCK.
0463	17002	126734		JMP PNCHA,I	YES, EXIT.
0464	17003	026740		JMP P1	NO, SET NEXT RECORD.

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0466*
0467* SUBROUTINE: LTG (LEADER/TRAILER GENERATOR)
0468*
0469*
0470* LTG PRODUCES APPROXIMATELY 10-INCHES
0471* OF BLANK TAPE (FEED-FRAMES)
0472*
0473 17004 000000 LTG NOP
0474 17005 002400 CLA SET FEED FRAME MODE A=0
0475 17006 016676 JSB PUNCH PUNCH FEED FRAMES
0476 17007 127004 JMP LTG,I EXIT.

0478*
0479* PUNCH BUFFER
0480*
0481 17010 017012 BUF DEF BUFFR
0482 17011 017013 BUF1 DEF BUFFR+1
0483*
0484 17012 000000 BUFFR BSS 30
0485 17050 000000 BUFF NOP
0486 17051 000000 T1 NOP
0487 17052 000000 T2 NOP
0488 17053 000000 T3 NOP
0489 17054 000000 T4 NOP
0490 17055 000000 CKSUM NOP

0492*
0493* MESSAGE STORAGE SECTION
0494*
0495 17056 017057 MA1 DEF MSG1
0496 17057 020120 MSG1 ASC 14, PHOTO READER I/O ADDRESS?
0497 17075 017076 MA2 DEF MSG2
0498 17076 020120 MSG2 ASC 10, PUNCH I/O ADDRESS?
0499 17110 017111 MA3 DEF MSG3
0500 17111 020124 MSG3 ASC 15, TURN ON TTY PUNCH, PRESS RUN
0501 17130 017131 MA4 DEF MSG4
0502 17131 020111 MSG4 ASC 10, INVALID I/O ADDRESS
0503 17143 017144 MA5 DEF MSG5
0504 17144 020123 MSG5 ASC 13, SYSTEM DUMP I/O ADDRESS?
0505 17161 017162 MA6 DEF MSG6
0506 17162 020103 MSG6 ASC 6, CURE SIZE?
0507 17170 017171 MA7 DEF MSG7
0508 17171 020111 MSG7 ASC 8, IMPROPER INPUT

0510*

0511* CONSTANT AND DATA SECTION

0512*

0513	17201	177700	MASK	OCT 177700	
0514	17202	177470	.200	DEC -200	
0515	17203	177637	M97	DEC -97	
0516	17204	177734	M36	DEC -36	
0517	17205	177720	N60	OCT -60	
0518	17206	177745	M27	DEC -27	
0519	17207	177747	M25	DEC -25	
0520	17210	177750	M24	DEC -24	
0521	17211	177754	M20	DEC -20	
0522	17212	177761	M15	DEC -15	
0523	17213	177764	M12	DEC -12	
0524	17214	177773	M5	DEC -5	
0525	17215	177774	CM.4	DEC -4	
0526	17216	177777	M1	DEC -1	
0527	17217	000003	C.03	DEC 3	
0528	17220	000004	.4	DEC 4	
0529	17221	000024	.20	DEC 20	
0530	17222	000036	.30	DEC 30	
0531	17223	000077	B77	OCT 77	
0532	17224	000207	.135	DEC 135	
0533	17225	000377	M377	OCT 377	
0534	17226	052525	UL52	OCT 52525	
0535*					
0536	17227	034000	C8K	OCT 34000	ACCEPTABLE
0537	17230	030466	C16K	OCT 30466	CORE
0538	17231	031064	C24K	OCT 31064	SIZE
0539	17232	031462	C32K	OCT 31462	ANSWERS
0540*					
0541	17233	017234	INCIN	DEF *+1	
0542	17234	020000		OCT 20000	RELOCATION
0543	17235	040000		OCT 40000	
0544	17236	060000		OCT 60000	INCREMENTS
0545*					
0546	17237	017677	LWM	DEF EOTC	LAST WORD AVAILABLE
0547	17240	015073	SERLA	DEF SRIAL	
0548*					
0549	17241	000000	SOURC	NOP	
0550	17242	000000	DEST	NOP	
0551	17243	000000	CHC1	NOP	
0552	17244	000000	IOADR	NOP	
0553*					
0554	17245	016662	PNCHO	DEF TOUT	PUNCH LINK LOCATION
0555	17246	016670	PNCHI	DEF POUT	PUNCH REFERENCE INSTRUCTION
0556*					
0557	17247	017367	LWAMR	DEF .HSPR-1	LWAM IF PHOTO READER
0558	17250	017346	LWAMP	DEF .PNCH-1	LWAM IF PUNCH

0560*

0561* LIST OF INSTRUCTIONS (ADDRESSES) TO BE SET

0562*

0563*

0564* TELETYPE INSTRUCTIONS ADDRESS LIST

0565*

0566	17251	017433	LIST1	DEF	TI.1
0567	17252	017434		DEF	TI.2
0568	17253	017435		DEF	TI.2+1
0569	17254	017437		DEF	TI.3
0570	17255	017442		DEF	TI.4
0571	17256	017522		DEF	TI.5
0572	17257	017523		DEF	TI.5+1
0573	17260	017531		DEF	TI.6
0574	17261	017533		DEF	TI.7
0575	17262	017534		DEF	TI.7+1
0576	17263	017447		DEF	TP.1
0577	17264	017456		DEF	TP.2-1
0578	17265	017457		DEF	TP.2
0579	17266	017462		DEF	TP.4
0580	17267	017463		DEF	TP.4+1
0581	17270	017464		DEF	TP.5
0582	17271	017471		DEF	TP.6
0583	17272	017500		DEF	TP.7
0584	17273	017502		DEF	TP.8
0585	17274	016701		DEF	TP.9
0586	17275	016731		DEF	TP.10
0587	17276	016663		DEF	TP.11
0588	17277	016664		DEF	TP.11+1
0589	17300	016665		DEF	TP.11+2

0590*

0591 17301 017251 LST1A DEF LIST1

0592*

0593* PHOTO READER INSTRUCTIONS ADDRESS LIST

0594*

0595	17302	017407	LIST2	DEF	PR3
0596	17303	017413		DEF	PR5
0597	17304	017415		DEF	PR6
0598	17305	017422		DEF	PR7
0599	17306	017307		DEF	RO

0600*

0601	17307	106700	RO	CLC	RDR
0602	17310	017302	LST2A	DEF	LIST2

0603*

0604* HIGH SPEED PUNCH INSTRUCTIONS ADDRESS LIST

0605*

0606	17311	017353	LIST3	DEF	PN3
0607	17312	017354		DEF	PN4
0608	17313	017355		DEF	PN5
0609	17314	017362		DEF	PN7
0610	17315	017316		DEF	PO
0611*					
0612	17316	106700	PO	CLC	PNCH
0613	17317	017311	LST3A	DEF	LIST3

PAGE 0015 #01 BASIC SYSTEM CONFIGURATER

0615*
0616* SYSTEM DUMP INSTRUCTIONS ADDRESS LIST
0617*
0618 17320 016732 LIST4 DEF PN8
0619 17321 016671 DEF POUT+1
0620 17322 016672 DEF POUT+2
0621 17323 016673 DEF POUT+3
0622*
0623 17324 017320 LST4A DEF LIST4

0625*
0626* SKIP DIFFERENCE IN WORDS BETWEEN PARALLEL AND
0627* SERIAL TELETYPE PACKAGES.
0628*
0629 17325 000000 BSS 22B (STOPI-SPNCH)-(TT.II-,PNCH)

PAGE 0016 #02 BASIC SYSTEM HIGH SPEED PUNCH DRIVER

0002*
 0003***** BASIC SYSTEM HIGH SPEED PUNCH DRIVER *****
 0004*
 0005* OUTPUTS ASCII THROUGH THE HIGH SPEED PUNCH
 0006*
 0007* CALL: JSB 103B,I
 0008*
 0009* (A) = NUMBER OF CHARACTERS TO BE PUNCHED
 0010* (B) = STARTING ADDRESS OF BUFFER
 0011*
 0012*
 0013* IF (A) IS ≥ 0 THEN OUTPUT (A) CHARACTERS
 FOLLOWED BY A CARRIAGE RETURN-LINE FEED.
 0014*
 0015*
 0016* IF (A) < 0 THEN PUNCH -(A) CHARACTERS ONLY.
 0017*
 0018* BUFFER CONTAINS ASCII CHARACTERS PACKED TWO PER WORD.
 0019*
 0020* IF (B) = 0 ON ENTRY (A) FEED FRAMES ARE PUNCHED.
 0021* IF (A) = 0 ON ENTRY ONLY A CR/LF IS PUNCHED.
 0022*
 0023*
 0024 17347 000000 .PNCH NOP
 0025 17350 017636 PN1 JSR INIT INITIALIZE FOR PUNCHING
 0026 17351 017622 PN2 JSB GETCH GET NEXT CHARACTER FROM BUFFER
 0027 17352 027360 JMP PN6 BUFFER EMPTY
 0028 17353 102600 PN3 OTA PNCH LOAD PUNCH BUFFER
 0029 17354 103700 PN4 STC PNCH,C GIVE PUNCH COMMAND
 0030 17355 102300 PN5 SFS PNCH
 0031 17356 027355 JMP *-1 WAIT FOR PUNCH READY
 0032 17357 027351 JMP PN2 GET NEXT CHARACTER
 0033*
 0034 17360 063671 PN6 LDA IORI RESTORE IOR INSTRUCTION
 0035 17361 073633 STA FINSH+1
 0036 17362 106700 PN7 CLC PNCH TURN OFF PUNCH
 0037 17363 002141 SEZ,CLE,RSS RECORD COMPLETE? CLEAR E
 0038 17364 127347 JMP .PNCH,I E=0, OUTPUT COMPLETE
 0039 17365 063655 LDA M2 E=1, APPEND CR AND LF
 0040 17366 067672 LDB CRLFA LOAD ADDRESS OF CR AND LF
 0041 17367 027350 JMP PN1 DO CR/LF

PAGE 0017 #02 BASIC SYSTEM HIGH SPEED PHOTO READER DRIVER

0043*
 0044***** BASIC SYSTEM PHOTO READER DRIVER *****
 0045*
 0046* INPUTS TAPE RECORDS THROUGH THE PHOTO READER
 0047*
 0048* CALL: JSB 101B,I
 0049*
 0050* (A) = MAXIMUM NUMBER CHARS IN RECORD
 0051* (B) = BUFFER STARTING ADDRESS
 0052*
 0053* ON RETURN (A)= -1 TOO MANY CHARACTERS IN RECORD
 0054* (A)= -2 END OF TAPE DETECTED
 0055* (A)= -3 NO TAPE OR GATE DOWN
 0056* (A)= NUMBER OF CHARACTERS IN RECORD
 0057*
 0058* INPUT IS PACKED TWO CHARACTERS PER WORD IN BUFFER.
 0059*
 0060* ALL RECORDS MUST BE TERMINATED WITH A LINE FEED.
 0061* THE NULL AND CARRIAGE RETURN CHARACTERS ARE IGNORED.
 0062*
 0063* THE LEFT ARROW(S) ~ DELETE THE PREVIOUS CHARACTER(S).
 0064*
 0065* AN ALT MODE ANYWHERE BEFORE THE LINE FEED DELETES ALL
 0066* CHARACTERS IN THE RECORD. THE RECORD IS IGNORED.
 0067*
 0068* IF 10 NULL CHARACTERS ARE DETECTED BEFORE ANY CHARACTER,
 0069* READING IS TERMINATED AND THE RETURN IS WITH A NULL RECORD.
 0070*
 0071*

0072	17370	000000	.HSPR	NOP	
0073	17371	073676		STA COUNT	SAVE LENGTH
0074	17372	077674		STB BUFSA	SAVE BUFFER STARTING ADDRESS
0075	17373	063653	PR1	LDA M11	
0076	17374	073677		STA EOTC	INITIALIZE EOT COUNTER
0077	17375	067674		LDB BUFSA	
0078	17376	077675		STB BADDR	INITIALIZE BUFFER POINTER
0079	17377	006400		CLB	INITIALIZE CHARACTER COUNT
0080	17400	006003	PR2	SZB,RSS	ANY NON-NUL CHARACTERS YET?
0081	17401	002002		SZA	NO, SKIP IF NULL
0082	17402	027407		JMP PR3	
0083	17403	037677		ISZ EOTC	COUNT NULL
0084	17404	027407		JMP PR3	NOT YET 10 NULLS
0085	17405	063655		LDA M2	SET A TO INDICATE EOT (-2)
0086	17406	027422		JMP PR7	10 NULLS, TURN OFF READER & EXIT
0087	17407	103700	PR3	STC RDR,C	REQUEST CHARACTER
0088	17410	002400		CLA	SET DELAY COUNT
0089	17411	002007	PR4	INA,SZA,RSS	DELAY = 6.4 * 65K = .41 SECONDS
0090	17412	027424		JMP PR8	(A)=0, NO TAPE OR GATE DOWN
0091	17413	102300	PR5	SFS RDR	
0092	17414	027411		JMF PR4	NO FLAG, CHECK DELAY COUNT
0093	17415	103500	PR6	LIA RDR,C	LOAD CHARACTER
0094	17416	017537		JSB PROCS	PROCESS CHARACTER
0095	17417	027400		JMP PR2	GET NEXT CHARACTER
0096	17420	057655		CPB M2	RUBOUT IN THIS RECORD?
0097	17421	027373		JMP PR1	YES, IGNORE RECORD
0098	17422	100700	PR7	CLC RDR	TURN OFF READER

PAGE 0018 #02 BASIC SYSTEM HIGH SPEED PHOTO READER DRIVER

0099 17423 127370 JMP .HSPR,I
0100*
0101 17424 063654 PR8 LDA M3 LOAD 'NO TAPE' STATUS
0102 17425 027422 JMP PR7

PAGE 0019 #02 BASIC SYSTEM TELETYPE INPUT DRIVER

0104*
0105***** BASIC SYSTEM TELETYPE INPUT DRIVER *****
0106*
0107* INPUTS FROM AN ASR 33/35 THROUGH THE
0108* TELETYPE CONTRCL BOARD FROM TAPE OR KEYBOARD.
0109*
0110* CALL: JSB 104B,I
0111*
0112* (A) = MAXIMUM NUMBER CHARS IN RECORD
0113* (B) = BUFFER STARTING ADDRESS
0114*
0115* RETURN: (A)= -1 TOO MANY CHARACTERS IN RECORD
0116* (A)= -2 RECORD DELETED
0117* (A)= NUMBER OF CHARACTERS IN RECORD
0118*
0119*
0120* THE CHARACTERS ARE PACKED TWO TO A WORD IN THE BUFFER.
0121*
0122* ALL RECLUDS MUST BE TERMINATED WITH A LINE FEED.
0123* THE NULL AND CARRIAGE RETURN CHARACTERS ARE IGNORED.
0124*
0125* THE LEFT ARROW(S) ← DELETE THE PREVIOUS CHARACTER(S).
0126*
0127* AN ALT MODE ANYWHERE BEFORE THE LINE FEED DELETES ALL
0128* CHARACTERS IN THE RECORD. THE RECORD IS IGNORED.
0129*
0130*
0131 17426 000000 TTY.I NOP
0132 17427 073676 STA COUNT SAVE LENGTH
0133 17430 077675 STB BADDR SET BUFFER ADDRESS
0134 17431 006400 CLB SET CHARACTER COUNTER
0135 17432 063444 LDA IMODE
0136 17433 102600 TI.1 OTA TTY SET TTY TO INPUT MODE
0137 17434 103700 TI.2 STC TTY,C REQUEST CHARACTER
0138 17435 102300 SFS TTY
0139 17436 027435 JMP *-1 WAIT FOR CHARACTER INPUT
0140 17437 102500 TI.3 LIA TTY LOAD CHARACTER
0141 17440 017537 JSB PROCS PROCESS CHARACTER
0142 17441 02/434 JMP TI.2 GET NEXT CHARACTER
0143 17442 106700 TI.4 CLC TTY
0144 17443 127426 JMP TTY.I,I RECORD COMPLETE RETURN
0145*
0146 17444 160000 IMODE OCT 160000 LIST ONLY (INPUT-ASR 35)

PAGE 0020 #02 BASIC SYSTEM TELETYPE OUTPUT DRIVER

0148*
 0149***** BASIC SYSTEM TELETYPE OUTPUT DRIVER *****
 0150*
 0151* OUTPUTS ASCII RECORDS THROUGH THE TELETYPE PRINTER,
 0152* PUNCH, OR BOTH.
 0153*
 0154* CALL: JSB 102B,I
 0155*
 0156* (A) = NUMBER OF CHARACTERS TO BE OUTPUT
 0157* (B) = STARTING ADDRESS OF BUFFER
 0158*
 0159*
 0160* IF (A) IS ≥ 0 THEN OUTPUT (A) CHARACTERS
 0161* FOLLOWED BY A CARRIAGE RETURN-LINE FEED.
 0162*
 0163* IF (A) < 0 THEN PUNCH -(A) CHARACTERS ONLY.
 0164*
 0165* BUFFER CONTAINS ASCII CHARACTERS PACKED TWO PER WORD.
 0166*
 0167* IF (B) = 0 ON ENTRY OUTPUT (A) FEED FRAMES.
 0168* IF (A) = 0 ON ENTRY ONLY A CR/LF IS OUTPUT.
 0169*
 0170*
 0171 17445 000000 TTY.P NOP
 0172 17446 017636 JSB INIT INITIALIZE AND SETUP
 0173 17447 060000 TP.1 LDA TTY SAVE TTY INTERRUPT
 0174 17450 073517 STA TEMPI INSTRUCTION
 0175 17451 060127 LDA LISTR
 0176 17452 050126 CPA PLSTR PLIST?
 0177 17453 063515 LDA PMODE YES
 0178 17454 050130 CPA TLSTR LIST?
 0179 17455 063516 LDA LMODE YES
 0180 17456 102600 OTA TTY SET TTY TO OUTPUT MODE
 0181 17457 074000 TP.2 STB TTY PUT NOP INTO INTERRUPT CELL
 0182 17460 017622 TP.3 JSB GETCH GET NEXT CHARACTER
 0183 17461 027502 JMP TP.8 BUFFER EMPTY
 0184 17462 102600 TP.4 OTA TTY LOAD TTY BOARD BUFFER
 0185 17463 103700 STC TTY,C GIVE PRINT COMMAND
 0186 17464 102300 TP.5 SFS TTY WAIT FOR
 0187 17465 027464 JMP *-1 FLAG
 0188 17466 063517 LDA TEMPI
 0189 17467 002003 SZA,RSS IS INTERRUPT ENABLED?
 0190 17470 027460 JMP TP.3 NO
 0191*
 0192* THIS SECTION CHECKS IF A CHARACTER HAS BEEN TYPED FROM THE
 0193* KEYBOARD DURING OUTPUT ON TELETYPE.
 0194*
 0195 17471 102500 TP.6 LIA TTY LOAD FROM BOARD BUFFER
 0196 17472 003000 CMA FIRST 8 BITS SHOULD BE 1'S
 0197 17473 013666 AND B177
 0198 17474 002003 SZA,RSS
 0199 17475 027460 JMP TP.3 NO KEY STRUCK, CONTINUE
 0200 17476 063671 LDA IORI
 0201 17477 073633 STA FINSH+1 RESTORE IOR INSTRUCTION
 0202 17500 106700 TP.7 CLC TTY TURN OFF TTY
 0203 17501 114105 JSB I,STP,I GO TO STOP

PAGE 0021 #02 BASIC SYSTEM TELETYPE OUTPUT DRIVER

0204	17502	106700	TP,8	CLC TTY	TURN OFF TTY
0205	17503	063517		LDA TEMPI	
0206	17504	053536		CPL TT,II	IS INTERRUPT MODE SET?
0207	17505	017527		JSB I.ON	YES, RE-ENABLE KEYBOARD
0208	17506	063671		LDA IORI	
0209	17507	073633		STA FINSH+1	RESTORE IOR INSTRUCTION
0210	17510	002141		SEZ,CLE,RSS	RECORD COMPLETE? CLEAR E
0211	17511	127445		JMP TTY,P,I	E=0, RECORD OUTPUT COMPLETE
0212	17512	063655		LDA M2	E=1, ADD A RETURN AND LINE FEED
0213	17513	067672		LDB CRLFA	LOAD ADDRESS OF CR AND LF
0214	17514	027446		JMP TTY,P+1	DO CR/LF
0215*					
0216	17515	110000	PMCDE OCT	110000	PUNCH ONLY (ASR 35)
0217	17516	120000	LMCDE OCT	120000	LIST ONLY (ASR 35)
0218*					
0219	17517	000000	TEMPI NOP		

0221*

0222* THIS ROUTINE TURNS OFF THE TELETYPE INTERRUPT MODE

0223*

0224	17520	000000	I.OFF	NOP	
0225	17521	002400		CLA	
0226	17522	070000	TI,5	STA TTY	SET NOP INTO INTERRUPT CELL
0227	17523	106700		CLC TTY	TURN OFF READ MODE
0228	17524	000000	R.CFF	NOP	SET TO CLC RDR IF RDR EXISTS
0229	17525	000000	P.CFF	NOP	SET TO CLC PNCH IF PNCH EXISTS
0230	17526	127520		JMP I.OFF,I	RETURN

0232*

0233* THIS ROUTINE TURNS ON THE TELETYPE INTERRUPT MODE

0234*

0235	17527	000000	I.CN	NOP	
0236	17530	063536		LDA TT,II	
0237	17531	070000	TI,6	STA TTY	SET JSB INTO INTERRUPT CELL
0238	17532	063444		LDA IMODE	
0239	17533	102600	TI,7	OTA TTY	SET TTY TO INPUT MODE
0240	17534	103700		STC TTY,C	SET TTY TO LOOK FOR INPUT
0241	17535	127527		JMP I.ON,I	RETURN
0242*					
0243	17536	114105	TT,II	JSB I.STP,I	INTERRUPT LOCATION CODE

PAGE 0022 #02 CHARACTER PROCESSING SECTION FOR INPUT

0245*				
0246*	CHARACTER PROCESSING SECTION FOR TTY AND PHOTOREADER			
0247*				
0248*	CALL:	JSB PROCS		
0249*	(A) HOLDS CHARACTER			
0250*				
0251*	RETURN:	F+1 - GET NEXT CHARACTER		
0252*		F+2 - RECORD COMPLETE		
0253*				
0254	17537	0000000	PRCCS NOP	
0255	17540	013666	AND B177	STRIP BIT 7
0256	17541	002003	SZA,RSS	NULL?
0257	17542	127537	JMP PROCS,I	YES, IGNORE
0258	17543	053656	CPA .2	NO, CONTROL B ?
0259	17544	127537	JMP PROCS,I	YES, IGNORE
0260	17545	053657	CPA .3	NO, CONTROL C ?
0261	17546	127537	JMP PROCS,I	YES, IGNORE
0262	17547	053660	CPA LNFD	NO, LINE FEED?
0263	17550	127537	JMP PROCS,I	YES, IGNORE
0264	17551	053666	CPA B177	NO, RUBOUT?
0265	17552	127537	JMP PROCS,I	YES, IGNORE
0266	17553	053665	CPA AMODE	NO, ALT MODE?
0267	17554	027616	JMP CMPLT-1	YES, CANCEL RECORD
0268	17555	053664	CPA OMODE	NO, OLD ALT MODE?
0269	17556	027616	JMP CMPLT-1	YES, CANCEL RECORD
0270	17557	053662	CPA EMODE	NO, ESCAPE MODE?
0271	17560	027616	JMP CMPLT-1	YES, CANCEL RECORD
0272	17561	053661	CPA CRTN	NO, CARRIAGE RETURN?
0273	17562	027617	JMP CMPLT	YES, COMPLETE RECORD
0274	17563	057676	CPB COUNT	NO, BUFFER OVERFLOW?
0275	17564	007400	CCB	YES, LOOK FOR CARRIAGE RETURN
0276	17565	006020	SSB	LOOKING FOR CARRIAGE RETURN?
0277	17566	127537	JMP PROCS,I	YES, RETURN
0278	17567	053663	CPA LFTAR	NO, LEFT ARROW?
0279	17570	027602	JMP DLETE	YES, DELETE PREVIOUS CHARACTER
0280	17571	006014	SLB,INB	NO, CHECK ODD/EVEN FLAG
0281	17572	027576	JMP PROC2	B0 = 0, EVEN CHARACTER
0282	17573	001727	PRCC1 ALF,ALF	B0 = 1, ODD CHARACTER
0283	17574	173675	STA BADDR,I	RECORD HIGH CHARACTER
0284	17575	127537	JMP PROCS,I	
0285	17576	133675	PRCC2 IOR BADDR,I	PACK TWO CHARACTERS
0286	17577	173675	STA BADDR,I	PUT IN BUFFER
0287	17600	037675	ISZ BADDR	INDEX BUFFER ADDRESS POINTER
0288	17601	127537	JMP PROCS,I	

PAGE 0023 #02 CHARACTER PROCESSING SECTION FOR INPUT

```

0290*
0291* THIS SECTION DELETES PREVIOUS CHARACTER(S)
0292*
0293 17602 006003 DLETE SZB,RSS      IS BUFFER EMPTY?
0294 17603 127537 JMP PROCS,I       YES, RETURN
0295 17604 003400 CCA                NO
0296 17605 044000 ADB 0              DECREMENT CHARACTER COUNT
0297 17606 006011 SLB,RSS           LOW CHARACTER?
0298 17607 127537 JMP PROCS,I       YES
0299 17610 043675 ADA BADDR         NO, DECREMENT
0300 17611 073675 STA BADDR         ADDRESS POINTER
0301 17612 163675 LDA BADDR,I      GET LAST TWO CHARACTERS
0302 17613 001727 ALF,ALF
0303 17614 013666 AND B177          DELETE LAST CHARACTER
0304 17615 027573 JMP PROC1        STORE NEXT-TO-LAST CHARACTER
0305*
0306* THIS SECTION PUTS COUNT IN A AND RETURNS TO P+2
0307*
0308 17616 067655 LDB M2            SET DELETE FLAG
0309 17617 060001 CMPLT LDA 1        PUT CHARACTER COUNT IN A
0310 17620 037537 ISZ PROCS
0311 17621 127537 JMP PROCS,I

0313*
0314* SUBROUTINE GETCH
0315*
0316* RETURN TO P+1 ON EMPTY BUFFER
0317* IF THE BUFFER IS NOT EMPTY, ELSE
0318* RETURN TO P+2 WITH CHARACTER IN (A).
0319*
0320 17622 000000 GETCH NOP
0321 17623 057676 CPB COUNT
0322 17624 127622 JMP GETCH,I      BUFFER EMPTY, P+1 RETURN
0323 17625 163675 LDA BADDR,I      GET TWO CHARACTERS
0324 17626 006011 SLB,RSS
0325 17627 001727 ALF,ALF         B EVEN, POSITION CHARACTER RIGHT
0326 17630 006014 SLB,INB          CHECK O/E, AND INDEX COUNT
0327 17631 037675 ISZ BADDR         B ODD, INCREMENT ADDRESS POINTER
0328 17632 013666 FINSH AND B177  STRIP LEFT CHARACTER
0329 17633 033667 IOR B200          ADD BIT 7
0330 17634 037622 ISZ GETCH
0331 17635 127622 JMP GETCH,I     RETURN TO P+2

```

0333*
0334* INITIALIZES FOR OUTPUTTING A RECORD
0335*
0336 17636 000000 INIT NOP
0337 17637 002320 CCE,SSA SET E=1, CHECK FOR (A) < 0
0338 17640 003104 CMA,CLE,INA SET (E) = 0, (A) = -(A)
0339 17641 073676 STA COUNT SAVE CHARACTER COUNT
0340 17642 077675 STB BADDR SET BUFFER STARTING ADDRESS
0341 17643 002002 SZA
0342 17644 006002 S2B LEADER/TRAILER ONLY?
0343 17645 027651 JMP *+4 NO
0344 17646 063670 LDA CLAI YES, (B) = 0
0345 17647 073633 STA FINSH+1 SET CLEAR INSTRUCTION
0346 17650 000040 CLE SET NO CR/LF
0347 17651 006400 CLB INITIALIZE OUTPUT COUNT
0348 17652 127636 JMP INIT,I

PAGE 0025 #02 DATA, ADDRESSES, ETC.

0350*

0351* COMMUN DRIVER CCNSTANTS AND ADDRESSES

0352*

0353	17653	177765	M11	DEC -11	
0354	17654	177775	M3	DEC -3	
0355	17655	177776	M2	DEC -2	
0356	17656	000002	.2	DEC 2	
0357	17657	000003	.3	DEC 3	
0358	17660	000012	LNFU	OCT 12	LINE FEED
0359	17661	000015	CRTN	OCT 15	CARRIAGE RETURN
0360	17662	000033	EMCDE	OCT 33	ESCAPE
0361	17663	000137	LFTAR	OCT 137	LEFT ARROW
0362	17664	000175	OMCDE	OCT 175	OBsolete ALT MODE
0363	17665	000176	AMCDE	OCT 176	ALT MODE
0364	17666	000177	B177	OCT 177	RUBOUT
0365	17667	000200	B200	OCT 200	
0366	17670	002400	CLAI	CLA	
0367	17671	033667	IORI	IOR B200	ADD IN BIT 7
0368*					
0369	17672	017673	CRLFA	DEF CRLF	
0370	17673	106612	CRLF	OCT 106612	
0371*					
0372	17674	000000	BUFSA	NOP	INITIAL BUFFER ADDRESS
0373	17675	000000	BALDR	NOP	CURRENT BUFFER ADDRESS
0374	17676	000000	COUNT	NOP	HOLDS RECORD LENGTH
0375	17677	000000	EOTC	NOP	END-OF-TAPE COUNTER
0376*					

0377* BASE PAGE REFERENCE ENTRIES

0378*

0379	00101		ORG	101B	
0380	00101	100105	DEF	I.STP,I	READER LINK INITIALIZED TO STOP
0381	00102	017445	DEF	TTY.P	TTY OUTPUT ENTRY ADDRESS
0382	00103	100102	DEF	102B,I	PUNCH LINK INITIALIZED TO TTY
0383	00104	017426	DEF	TTY.I	TTY INPUT ENTRY ADDRESS
0384	00105	000000	I.STP	NOP	LINK TO STOP ROUTINE
0385	00106	000000	LWBM	NUP	LAST WORD OF USER SPACE
0386	00107	000000		NOP	
0387	00110	000135	FWAM	DEF 135B	FIRST WORD OF AVAILABLE MEMORY
0388	00111	017425	LWAM	DEF TTY.I-1	LAST WORD OF AVAILABLE MEMORY
0389*					
0390	00123		ORG	123B	
0391	00123	017520	IMOFF	DEF I.OFF	DISABLE KEYBOARD INTERRUPT
0392	00124	017527	IMCN	DEF I.ON	SET KEYBOARD INTERRUPT
0393	00125	017424	TLINK	DEF I.TTY+2000B	TTY INPUT INTERRUPT LINK
0394	00126	100103	PLSTR	DEF 103B,I	PLIST OUTPUT ADDRESS
0395	00127	100102	LISTR	DEF 102B,I	LIST DEVICE LINK
0396	00130	100102	TLSTR	DEF 102B,I	LIST OUTPUT ADDRESS
0397*					
0398	00117		SYNTA	EQU 117B	
0399	00131		IOBFA	EQU 131B	BUFFER ADDRESS
0400	00134		SBLFA	EQU 134B	SYNTAX BUFFER ADDRESS
0401	00000		RDR	EQU 0	
0402	00000		PNCH	EQU 0	
0403	00000		TTY	EQU 0	
0404	00001		TTYI	EQU TTY+1	

PAGE 0026 #03 SERIAL TELETYPE PACKAGE

0002*
 0003* MODIFY PBS FOR SERIAL TELETYPE
 0004*
 0005 15073 ORG 15073B
 0006*
 0007 15073 063653 SRIAL LDA SM11 SET
 0008 15074 067302 LDB L8T5A TTY PUNCH
 0009 15075 117257 JSB SETIA,I ADDRESSES
 0010 15076 137260 ISZ IOADA,I INCREMENT SELECT CODE
 0011 15077 063262 LDA SM5 SET
 0012 15100 067310 LDB LST6A TTY READER
 0013 15101 117257 JSB SETIA,I ADDRESSES
 0014 15102 063263 LDA TT.IS SET INTERRUPT
 0015 15103 070001 T16 STA TTYI CELL
 0016*
 0017 15104 063241 LDA TTYPI SET OUTPUT
 0018 15105 173221 STA COR1A,I
 0019 15106 173223 STA CUR3A,I TELETYPE CALLS
 0020 15107 173224 STA DMP1A,I
 0021 15110 173226 STA GETAA,I TO SERIAL
 0022 15111 173230 STA GET2A,I
 0023 15112 173231 STA CRL1A,I DRIVER
 0024*
 0025 15113 063243 LDA STF0 SET INPUT
 0026 15114 173222 STA COR2A,I
 0027 15115 173227 STA GET1A,I TELETYPE CALLS
 0028 15116 037222 ISZ COR2A
 0029 15117 037227 ISZ GET1A TO SERIAL
 0030 15120 063242 LDA TTYII
 0031 15121 173222 STA COR2A,I DRIVER
 0032 15122 173227 STA GET1A,I
 0033 15123 037222 ISZ COR2A
 0034 15124 037227 ISZ GET1A
 0035 15125 063244 LDA CLF0
 0036 15126 173222 STA COR2A,I
 0037 15127 173227 STA GET1A,I
 0038*
 0039 15130 002400 CLA CLEAR
 0040 15131 173232 STA TP9A,I
 0041 15132 037232 ISZ TP9A BUFFERED TELETYPE
 0042 15133 173232 STA TP9A,I
 0043 15134 173233 STA TP10A,I INSTRUCTIONS
 0044 15135 173225 STA DMP2A,I
 0045 15136 037225 ISZ DMP2A
 0046 15137 173225 STA DMP2A,I
 0047*
 0048 15140 063245 LDA STOUA SET FOR POSSIBLE
 0049 15141 173234 STA TOUTA,I TTY PUNCHING
 0050*
 0051 15142 063316 LDA LST7A USE READER AND PUNCH
 0052 15143 173237 STA PHRLA,I DRIVERS IN
 0053 15144 063324 LDA LST8A SERIAL TELETYPE
 0054 15145 173240 STA PNCLA,I PACKAGE

PAGE 0027 #03 SERIAL TELETYPE PACKAGE

0056	15146	063246	LDA ROFFA	PREPARE TO SET	
0057	15147	173217	STA PHR1A,I	INTERRUPT-OFF INSTRUCTIONS	
0058	15150	063247	LDA POFFA	IN SERIAL TELETYPE	
0059	15151	173220	STA NOR1A,I	PACKAGE	
0060*					
0061	15152	063250	LDA SLWMT	SET SERIAL	
0062	15153	070111	STA LWAM		
0063	15154	063251	LDA SLWMR	TELETYPE VALUES	
0064	15155	173235	STA LWMRA,I		
0065	15156	063252	LDA SLWMP	IN LWAM CONSTANTS	
0066	15157	173236	STA LWMPA,I		
0067	15160	063253	LDA STTYP		
0068	15161	070102	STA 102B		
0069	15162	063254	LDA STTYI		
0070	15163	070104	STA 104B		
0071	15164	063255	LDA SIOFF		
0072	15165	070123	STA IMOFF		
0073	15166	063256	LDA SION		
0074	15167	070124	STA IMON		
0075*					
0076*	OVERLAY PARALLEL DRIVERS WITH SERIAL DRIVERS				
0077*					
0078	15170	163264	SRIA1 LDA MOVES,I	MOVE A	
0079	15171	173265	STA DESTS,I	WORD	
0080	15172	037264	ISZ MOVES	BUMP	
0081	15173	037265	ISZ DESTS	POINTERS	
0082	15174	037266	ISZ SMCNT	SERIAL DRIVERS MOVED?	
0083	15175	027170	JMP SRIA1	NO	
0084	15176	127261	JMP PHRDA,I	YES, RETURN TO MAIN SEQUENCE	

0086*					
0087*	SUBROUTINE (STOUT) TO OUTPUT ONE CHARACTER TO THE				
0088*	TELETYPE. CHARACTER IS IN (A). (B) IS NOT ALTERED.				
0089*					
0090	15177	000000	STCUT NOP		
0091	15200	073455	STA TCHAR		
0092	15201	063653	LDA SM11	SET BIT	
0093	15202	073517	STA BCNT	COUNTER	
0094	15203	063455	LDA TCHAR		
0095	15204	001000	ALS	ADD	
0096	15205	033520	IOR B3000	CONTROL BITS	
0097	15206	102700	TP7	TURN ON TELETYPE	
0098	15207	103600	TP8	OUTPUT BIT	
0099	15210	001300	RAR	POSITION NEXT BIT	
0100	15211	102300	TP9	WAIT FOR	
0101	15212	027211	JMP **-1	COMPLETION FLAG	
0102	15213	037517	ISZ BCNT	DONE?	
0103	15214	027207	JMP TP8	NO	
0104	15215	106700	TP10 CLC TTY	YES, TURN OFF TELETYPE	
0105	15216	127177	JMP STOUT,I		

0107*

0108* MODIFICATION ADDRESSES

0109*

0110 15217 016364 PHR1A DEF PHRD1
 0111 15220 016402 NOR1A DEF NORD1
 0112 15221 016424 COR1A DEF CORA1
 0113 15222 016427 COR2A DEF CORA2
 0114 15223 016453 COR3A DEF CORA3
 0115 15224 016551 DMP1A DEF DUMP1
 0116 15225 016552 DMP2A DEF DUMP2
 0117 15226 016572 GETAA DEF GETAD+1
 0118 15227 016575 GET1A DEF GETA1
 0119 15230 016607 GET2A DEF GETA2
 0120 15231 016644 CRL1A DEF CRLF1
 0121 15232 016700 TP9A DEF TP.9-1
 0122 15233 016731 TP10A DEF TP.10
 0123 15234 017245 TOUTA DEF PNCHO
 0124 15235 017247 LWMPRA DEF LWAMR
 0125 15236 017250 LWMPA DEF LWAMP
 0126 15237 017310 PHRLA DEF LST2A
 0127 15240 017317 PNCLA DEF LST3A

0128*

0129* MODIFICATION INSTRUCTIONS

0130*

0131 15241 017466 TTYP1 JSB .TTYP
 0132 15242 017404 TTYYI JSB .TTYYI
 0133 15243 102100 STF0 STF 0
 0134 15244 103100 CLFW CLF 0
 0135 15245 015177 STCUA DEF STOUT
 0136 15246 073524 RUFFA STA .ROFF
 0137 15247 073525 POFFA STA .POFF
 0138 15250 017403 SLWMT DEF .TTYI-1+2000B LWAM OPTIONS
 0139 15251 017345 SLWMR DEF HSPR-1+2000B FOR SERIAL
 0140 15252 017324 SLWMP DEF SPNCH-1+2000B TELETYPE
 0141 15253 017466 STTYP DEF .TTYP+2000B
 0142 15254 017404 STTYI DEF .TTYI+2000B
 0143 15255 017521 SICFF DEF .IOFF+2000B
 0144 15256 017531 SICN DEF .ION+2000B

0145*

0146* COMMUNICATION LINKS

0147*

0148 15257 016646 SETIA DEF SETI
 0149 15260 017244 IOADA DEF IOADR
 0150 15261 016353 PHRDA DEF PHRDR

0151*

0152* LOCAL CONSTANTS AND ADDRESSES

0153*

0154 15262 177773 SM5 DEC -5
 0155 15263 114125 TT.IS JSB TLINK,I TTY INTERRUPT INSTRUCTION
 0156 15264 015325 MOVES DEF SPNCH
 0157 15265 017325 DESTS DEF SPNCH+2000B
 0158 15266 177566 SMCNT ABS SPNCH-SPROC

PAGE 0029 #03 SERIAL TELETYPE PACKAGE

0160*
0161* TELETYPE OUTPUT INSTRUCTION LIST
0162*
0163 15267 015476 LIST5 DEF TP2-1
0164 15270 015477 DEF TP2
0165 15271 015501 DEF TP2+2
0166 15272 015505 DEF TP3-1
0167 15273 015506 DEF TP3
0168 15274 015456 DEF TP5
0169 15275 015523 DEF TP6
0170 15276 015206 DEF TP7
0171 15277 015207 DEF TP8
0172 15300 015211 DEF TP9
0173 15301 015215 DEF TP10
0174*
0175 15302 015267 LST5A DEF LIST5
0176*
0177* TELETYPE INPUT INSTRUCTION LIST
0178*
0179 15303 015426 LIST6 DEF TI2
0180 15304 015437 DEF TI3
0181 15305 015462 DEF TI4
0182 15306 015522 DEF TI5
0183 15307 015103 DEF TI6
0184*
0185 15310 015303 LST6A DEF LIST6
0186*
0187* PHOTOREADER INSTRUCTION LIST
0188*
0189 15311 017365 LIST7 DEF PR.3+2000B
0190 15312 017371 DEF PR.5+2000B
0191 15313 017373 DEF PR.6+2000B
0192 15314 017400 DEF PR.7+2000B
0193 15315 017307 DEF RU
0194*
0195 15316 015311 LST7A DEF LIST7
0196*
0197* HIGH-SPEED PUNCH INSTRUCTION LIST
0198*
0199 15317 017331 LIST8 DEF PN.2+2000B
0200 15320 017332 DEF PN.3+2000B
0201 15321 017333 DEF PN.4+2000B
0202 15322 017340 DEF PN.6+2000B
0203 15323 017316 DEF PO
0204*
0205 15324 015317 LST8A DEF LIST8

PAGE 0030 #03 BASIC SYSTEM HIGH SPEED PUNCH DRIVER

```

0207*
0208***** BASIC SYSTEM HIGH SPEED PUNCH DRIVER *****
0209*
0210*   OUTPUTS ASCII THROUGH THE HIGH SPEED PUNCH
0211*
0212*   CALL: JSB 103B,I
0213*
0214*           (A) = NUMBER OF CHARACTERS TO BE PUNCHED
0215*           (B) = STARTING ADDRESS OF BUFFER
0216*
0217*
0218*           IF (A) IS >= 0 THEN OUTPUT (A) CHARACTERS
0219*           FOLLOWED BY A CARRIAGE RETURN-LINE FEED.
0220*
0221*           IF (A) < 0 THEN PUNCH -(A) CHARACTERS ONLY.
0222*
0223*           BUFFER CONTAINS ASCII CHARACTERS PACKED TWO PER WORD.
0224*
0225*           IF (B) = 0 ON ENTRY (A) FEED FRAMES ARE PUNCHED.
0226*           IF (A) = 0 ON ENTRY ONLY A CR/LF IS PUNCHED.
0227*
0228*
0229  15325 000000  SPNCH NOP
0230  15326 017636  JSB SINIT      INITIALIZE FOR PUNCHING
0231  15327 017622  PN.1  JSB SGTCH    GET NEXT CHARACTER FROM BUFFER
0232  15330 027336  JMP PN.5      BUFFER EMPTY
0233  15331 102600  PN.2  OTA PNCH    LOAD PUNCH BUFFER
0234  15332 103700  PN.3  STC PNCH,C  GIVE PUNCH COMMAND
0235  15333 102300  PN.4  SFS PNCH
0236  15334 027333  JMP *-1       WAIT FOR PUNCH READY
0237  15335 027327  JMP PN.1      GET NEXT CHARACTER
0238*
0239  15336 063671  PN.5  LDA SIORI
0240  15337 073633  STA SFNSH+1  RESTORE IOR INSTRUCTION
0241  15340 106700  PN.6  CLC PNCH    TURN OFF PUNCH
0242  15341 002141  SEZ,CLE,RSS  RECORD COMPLETE? CLEAR E
0243  15342 127325  JMP SPNCH,I   E=0, OUTPUT COMPLETE
0244  15343 063655  LDA SM2      E=1, APPEND CR AND LF
0245  15344 067672  LDB SCRLA   LOAD ADDRESS OF CR AND LF
0246  15345 027326  JMP SPNCH+1  DO CR/LF

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PAGE 0031 #03 BASIC SYSTEM HIGH SPEED PHOTO READER DRIVER

0248*
 0249***** BASIC SYSTEM PHOTO READER DRIVER *****
 0250*
 0251* INPUTS TAPE RECORDS THROUGH THE PHOTO READER
 0252*
 0253* CALL: JSB 101B,I
 0254*
 0255* (A) = MAXIMUM NUMBER CHARS IN RECORD
 0256* (B) = BUFFER STARTING ADDRESS
 0257*
 0258* ON RETURN (A)= -1 TOO MANY CHARACTERS IN RECORD
 0259* (A)= -2 END OF TAPE DETECTED
 0260* (A)= -3 NO TAPE OR GATE DOWN
 0261* (A)= NUMBER OF CHARACTERS IN RECORD
 0262*
 0263* INPUT IS PACKED TWO CHARACTERS PER WORD IN BUFFER.
 0264*
 0265* ALL RECORDS MUST BE TERMINATED WITH A LINE FEED.
 0266* THE NULL AND CARRIAGE RETURN CHARACTERS ARE IGNORED.
 0267*
 0268* THE LEFT ARROW(S) ~ DELETE THE PREVIOUS CHARACTER(S).
 0269*
 0270* AN ALT MODE ANYWHERE BEFORE THE LINE FEED DELETES ALL
 0271* CHARACTERS IN THE RECORD. THE RECORD IS IGNORED.
 0272*
 0273* IF 10 NULL CHARACTERS ARE DETECTED BEFORE ANY CHARACTER,
 0274* READING IS TERMINATED AND THE RETURN IS WITH A NULL RECORD.
 0275*
 0276*
 0277 15346 000000 HSPR NOP
 0278 15347 073676 STA SCONT SAVE LENGTH
 0279 15350 077674 STB SBFSA SAVE BUFFER STARTING ADDRESS
 0280 15351 063653 PR.1 LDA SM11
 0281 15352 073677 STA SEOTC INITIALIZE EOT COUNTER
 0282 15353 067674 LDB SBFSA
 0283 15354 077675 STB SBDDR
 0284 15355 006400 CLB
 0285 15356 006003 PR.2 SZB,RSS
 0286 15357 002002 SZA
 0287 15360 027365 JMP PR.3
 0288 15361 037677 ISZ SEOTC COUNT NULL
 0289 15362 027365 JMP PR.3
 0290 15363 063655 LDA SM2
 0291 15364 027400 JMP PR.7
 0292 15365 103700 PR.3 STC RDR,C
 0293 15366 002400 CLA
 0294 15367 002007 PR.4 INA,SZA,RSS
 0295 15370 027402 JMP PR.8
 0296 15371 102300 PR.5 SFS RDR
 0297 15372 027367 JMP PR.4
 0298 15373 103500 PR.6 LIA RDR,C
 0299 15374 017537 JSB SPROC
 0300 15375 027356 JMP PR.2
 0301 15376 057655 CPB SM2
 0302 15377 027351 JMP PR.1
 0303 15400 106700 PR.7 CLC RUR

PAGE 0032 #03 BASIC SYSTEM HIGH SPEED PHOTO READER DRIVER

0304 15401 127346 JMP HSPR,I

0305*

0306 15402 063654 PR.8 LDA 8M3 LOAD 'NO TAPE' STATUS

0307 15403 027400 JMP PR.7

PAGE 0033 #03 BASIC SYSTEM TELETYPE INPUT DRIVER

0309*
0310***** BASIC SYSTEM TELETYPE INPUT DRIVER *****
0311*
0312* INPUTS FROM AN ASR 33/35 THROUGH THE
0313* TELETYPE CONTROL BOARD FROM TAPE OR KEYBOARD.
0314*
0315* CALL: JSB 104B,I
0316*
0317* (A) = MAXIMUM NUMBER CHARS IN RECORD
0318* (B) = BUFFER STARTING ADDRESS
0319*
0320* RETURN: (A)= -1 TOO MANY CHARACTERS IN RECORD
0321* (A)= -2 RECORD DELETED
0322* (A)= NUMBER OF CHARACTERS IN RECORD
0323*
0324*
0325* THE CHARACTERS ARE PACKED TWO TO A WORD IN THE BUFFER.
0326*
0327* ALL RECORDS MUST BE TERMINATED WITH A LINE FEED.
0328* THE NULL AND CARRIAGE RETURN CHARACTERS ARE IGNORED.
0329*
0330* THE LEFT ARROW(S) ~ DELETE THE PREVIOUS CHARACTER(S).
0331*
0332* AN ALT MODE ANYWHERE BEFORE THE LINE FEED DELETES ALL
0333* CHARACTERS IN THE RECORD. THE RECORD IS IGNORED.
0334*
0335*
0336 15404 000000 .TTYI NOP
0337 15405 073676 STA SCONT SAVE LENGTH
0338 15406 077675 STB SBDDR SAVE BUFFER ADDRESS
0339 15407 006400 CLB ZERO CHARACTER COUNT
0340 15410 063456 LDA TP5 SET
0341 15411 073434 STA OUTB ECHO
0342 15412 017457 TII JSB TTINT INITIALIZE FOR INPUT CHARACTER
0343 15413 063454 LDA BITS WAIT FOR
0344 15414 002002 SZA CHARACTER
0345 15415 027413 JMP *-2 COMPLETE
0346 15416 063455 LDA TCHAR PROCESS
0347 15417 017537 JSB SPROC CHARACTER
0348 15420 027412 JMP TII GET NEXT CHARACTER
0349 15421 006400 CLB CLEAR
0350 15422 077434 STB OUTB ECHO
0351 15423 127404 JMP .TTYI,I

PAGE 0034 #03 BASIC SYSTEM TELETYPE INPUT DRIVER

0353*

0354* THIS SECTION PROCESSES EACH BIT AS IT BECOMES AVAILABLE.

0355* RETURN THROUGH 105B IF THE INTERRUPT MODE FLAG IS SET UPON

0356* CHARACTER COMPLETION.

0357*

0358	15424	000000	I.TTY	NOP	
0359	15425	073453		STA ATEMP	SAVE (A)
0360	15426	103501	TI2	LIA TTYI,C	MERGE
0361	15427	033455		IOR TCHAR	NEW BIT
0362	15430	001300		RAR	INTO
0363	15431	073455		STA TCHAR	CHARACTER
0364	15432	001727		ALF,ALF	POSITION BIT
0365	15433	001222		RAL,RAL	FOR ECHO
0366	15434	000000	OUTB	NOP	OUTPUT INSTRUCTION
0367	15435	037454		ISZ BITS	BIT 11?
0368	15436	027451		JMP EXIT	NO
0369	15437	106701	TI3	CLC TTYI	YES
0370	15440	063455		LDA TCHAR	ALIGN
0371	15441	001723		ALF,RAR	COMPLETED
0372	15442	073455		STA TCHAR	CHARACTER
0373	15443	063536		LDA STOPI	STOP FLAG
0374	15444	002003		SZA,RSS	SET?
0375	15445	027451		JMP EXIT	NO
0376	15446	063671		LDA SIORI	YES, RESTORE
0377	15447	073633		STA SFNSH+1	IOR INSTRUCTION
0378	15450	114105		JSB I.STP,I	GO TO STOP
0379	15451	063453	EXIT	LDA ATEMP	RESTORE (A)
0380	15452	127424		JMP I.TTY,I	
0381*					
0382	15453	000000	ATEMP	NOP	
0383	15454	000000	BITS	NOP	
0384	15455	000000	TCHAR	NOP	
0385*					
0386	15456	102600	TP5	OTA TTY	ECHO BIT INSTRUCTION

0388*

0389* THIS ROUTINE INITIALIZES THE SERIAL TELETYPE INPUT ROUTINE

0390* AND SETS TELETYPE TO ACCEPT INPUT.

0391*

0392	15457	000000	TTINT	NOP	
0393	15460	063653		LDA SM11	SET
0394	15461	073454		STA BITS	BIT COUNTER
0395	15462	103701	TI4	STC TTYI,C	DEMAND INPUT
0396	15463	002400		CLA	ZERO OUT
0397	15464	073455		STA TCHAR	CHARACTER REPOSITORY
0398	15465	127457		JMP TTINT,I	

PAGE 0635 #03 BASIC SYSTEM TELETYPE OUTPUT DRIVER

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0400*
0401***** BASIC SYSTEM TELETYPE OUTPUT DRIVER ****
0402*
0403*     OUTPUTS ASCII RECORDS THROUGH THE TELETYPE PRINTER,
0404*     PUNCH, OR BOTH.
0405*
0406*     CALL: JSB 102B,I
0407*
0408*             (A) = NUMBER OF CHARACTERS TO BE OUTPUT
0409*             (B) = STARTING ADDRESS OF BUFFER
0410*
0411*
0412*     IF (A) IS >= 0 THEN OUTPUT (A) CHARACTERS
0413*     FOLLOWED BY A CARRIAGE RETURN-LINE FEED.
0414*
0415*     IF (A) < 0 THEN PUNCH -(A) CHARACTERS ONLY.
0416*
0417*     BUFFER CONTAINS ASCII CHARACTERS PACKED TWO PER WORD.
0418*
0419*     IF (B) = 0 ON ENTRY OUTPUT (A) FEED FRAMES.
0420*     IF (A) = 0 ON ENTRY ONLY A CR/LF IS OUTPUT.
0421*
0422*
0423 15466 000000 .TTYP NOP
0424 15467 017636 JSB SINIT      INITIALIZE FOR OUTPUT
0425 15470 063653 TP1   LDA SM11      SET BIT
0426 15471 073517 STA BCNT      COUNTER
0427 15472 017622 JSB SGTCH      FETCH NEXT CHARACTER FROM BUFFER
0428 15473 027510 JMP TP4       BUFFER EMPTY
0429 15474 001000 ALS          ADD BIT 7 AND
0430 15475 033520 IOR B3000      CONTROL BITS
0431 15476 102700 STC TTY       REQUEST PRINT
0432 15477 103600 TP2   OTA TTY,C      OUTPUT BIT
0433 15500 001300 RAR          POSITION NEXT BIT
0434 15501 102300 SFS TTY       WAIT FOR
0435 15502 027501 JMP *-1       BIT OUT FLAG
0436 15503 037517 ISZ BCNT      CHARACTER OUT?
0437 15504 027477 JMP TP2       NO
0438 15505 106700 CLC TTY       YES, TURN OFF TTY
0439 15506 102100 TP3   STF TTY       SET FLAG BUFFER (RESETS TIMER)
0440 15507 027470 JMP TP1
0441*
0442 15510 063671 TP4   LDA SIORI      RESTORE IOR
0443 15511 073633 STA SFNSH+1      INSTRUCTION
0444 15512 002141 SEZ,CLE,RSS      DONE?
0445 15513 127466 JMP .TTYP,I      YES
0446 15514 063655 LDA SM2        NO
0447 15515 067672 LDB SCRLA      DO CR/LF
0448 15516 027467 JMP .TTYP+1
0449*
0450 15517 000000 BCNT NOP
0451 15520 003000 B3000 OCT 3000

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PAGE 0037 #03 CHARACTER PROCESSING SECTION FOR INPUT

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0476*
0477* CHARACTER PROCESSING SECTION FOR TTY AND PHOTOREADER
0478*
0479* CALL: JSB PROCS
0480* (A) HOLDS CHARACTER
0481*
0482* RETURN: P+1 - GET NEXT CHARACTER
0483* F+2 - RECORD COMPLETE
0484*
0485 15537 000000 SPROC NOP
0486 15540 013666 AND SB177 STRIP BIT 7
0487 15541 002003 SZA,RSS NULL?
0488 15542 127537 JMP SPROC,I YES, IGNORE
0489 15543 053656 CPA S.2 NO, CONTROL B?
0490 15544 127537 JMP SPROC,I YES, IGNORE
0491 15545 053657 CPA S.3 NO, CONTROL C?
0492 15546 127537 JMP SPROC,I YES, IGNORE
0493 15547 053660 CPA SLNFD NO, LINE FEED?
0494 15550 127537 JMP SPROC,I YES, IGNORE
0495 15551 053666 CPA SB177 NO, RUBOUT?
0496 15552 127537 JMP SPROC,I YES, IGNORE
0497 15553 053665 CPA SAMDE NO, ALT MODE?
0498 15554 027616 JMP SCMPL-1 YES, CANCEL RECORD
0499 15555 053664 CPA SOMDE NO, OLD ALT MODE?
0500 15556 027616 JMP SCMPL-1 YES, CANCEL RECORD
0501 15557 053662 CPA SEMDE NO, ESCAPE MODE?
0502 15560 027616 JMP SCMPL-1 YES, CANCEL RECORD
0503 15561 053661 CPA SCRTN NO, CARRIAGE RETURN?
0504 15562 027617 JMP SCMPL YES, COMPLETE RECORD
0505 15563 057676 CPB SCONT NO, BUFFER OVERFLOW?
0506 15564 007400 CCB YES, LOOK FOR CARRIAGE RETURN
0507 15565 006020 SSB LOOKING FOR CARRIAGE RETURN?
0508 15566 127537 JMP SPROC,I YES, RETURN
0509 15567 053663 CPA SLFTA NO, LEFT ARROW?
0510 15570 027602 JMP SDLTE YES, DELETE PREVIOUS CHARACTER
0511 15571 006014 SLB,INB NO, CHECK ODD/EVEN FLAG
0512 15572 027576 JMP SPR02 B0 = 0, EVEN CHARACTER
0513 15573 001727 SPR01 ALF,ALF B0 = 1, ODD CHARACTER
0514 15574 173675 STA SBDDR,I RECORD HIGH CHARACTER
0515 15575 127537 JMP SPROC,I
0516 15576 133675 SPRU2 IOR SBDDR,I PACK TWO CHARACTERS
0517 15577 173675 STA SBDDR,I PUT IN BUFFER
0518 15600 037675 ISZ SBDDR INDEX BUFFER ADDRESS POINTER
0519 15601 127537 JMP SPROC,I

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PAGE 0036 #03 BASIC SYSTEM TELETYPE OUTPUT DRIVER

0453*
0454* THIS ROUTINE TURNS OFF THE TELETYPE INTERRUPT MODE
0455*
0456 15521 000000 .ICFF NOP
0457 15522 106701 TI5 CLC TTYI TURN OFF KEYBOARD
0458 15523 106700 TP6 CLC TTY TURN OFF PRINTER
0459 15524 000000 .RCFF NOP SET TO CLC RDR IF READER EXISTS
0460 15525 000000 .PCFF NOP SET TO CLC PNCH IF PUNCH EXISTS
0461 15526 002400 CLA CLEAR
0462 15527 073536 STA STOPI STOP FLAG
0463 15530 127521 JMP .IOFF,I

0465*
0466* THIS ROUTINE TURNS ON THE TELETYPE INTERRUPT MODE
0467*
0468 15531 000000 .ICN NOP
0469 15532 003400 CCA SET STOP FLAG
0470 15533 073536 STA STOPI FOR INTERRUPTS
0471 15534 017457 JSB TTINI ENABLE KEYBOARD
0472 15535 127531 JMP .ION,I
0473*
0474 15536 000000 S1CPI NOP STOP FLAG (INITIALIZED OFF)

PAGE 0038 #03 CHARACTER PROCESSING SECTION FOR INPUT

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0521*
0522* THIS SECTION DELETES PREVIOUS CHARACTER(S)
0523*
0524 15602 006003 SDLTE SZB,RSS IS BUFFER EMPTY?
0525 15603 127537 JMP SPROC,I YES, RETURN
0526 15604 003400 CCA NO
0527 15605 044000 ADB 0 DECREMENT CHARACTER COUNT
0528 15606 006011 SLB,RSS LOW CHARACTER?
0529 15607 127537 JMP SPROC,I YES
0530 15610 043675 ADA SBDDR NO, DECREMENT
0531 15611 073675 STA SBDDR ADDRESS POINTER
0532 15612 163675 LDA SBDDR,I GET LAST TWO CHARACTERS
0533 15613 001727 ALF,ALF
0534 15614 013666 AND SB177 DELETE LAST CHARACTER
0535 15615 027573 JMP SPRO1 STORE NEXT-TO-LAST CHARACTER
0536*
0537* THIS SECTION PUTS COUNT IN A AND RETURNS TO P+2
0538*
0539 15616 067655 LDB SM2 SET DELETE STATUS
0540 15617 060001 SCPPL LDA 1 PUT CHARACTER COUNT INTO (A)
0541 15620 037537 ISZ SPROC
0542 15621 127537 JMP SPROC,I

0544*
0545* SUBROUTINE GETCH
0546*
0547* RETURN TO P+1 ON EMPTY BUFFER
0548* IF THE BUFFER IS NOT EMPTY, ELSE
0549* RETURN TO P+2 WITH CHARACTER IN (A).
0550*
0551 15622 000000 SGTCH NOP
0552 15623 057676 CPB SCONT
0553 15624 127622 JMP SGTCH,I BUFFER EMPTY, P+1 RETURN
0554 15625 163675 LDA SBDDR,I GET TWO CHARACTERS
0555 15626 006011 SLB,RSS
0556 15627 001727 ALF,ALF B EVEN, POSITION CHARACTER RIGHT
0557 15630 006014 SLB,INB CHECK O/E, AND INDEX COUNT
0558 15631 037675 ISZ SBDDR B ODD, INCREMENT ADDRESS POINTER
0559 15632 013666 SFNSH AND SB177 STRIP LEFT CHARACTER
0560 15633 033667 IOR SB200 ADD BIT 7
0561 15634 037622 ISZ SGTCH
0562 15635 127622 JMP SGTCH,I RETURN TO P+2

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0564*
0565* INITIALIZES FOR OUTPUTTING A RECORD
0566*
0567 15636 000000 SINIT NOP
0568 15637 002320 CCE,SSA SET E=1, CHECK FOR (A) < 0
0569 15640 003104 CMA,CLE,INA SET (E) = 0, (A) = -(A)
0570 15641 073676 STA SCONT SAVE CHARACTER COUNT
0571 15642 077675 STB SBDDR SAVE BUFFER STARTING ADDRESS
0572 15643 002002 SZA
0573 15644 006002 SZB LEADER/TRAILER ONLY?
0574 15645 027651 JMP ++4 NO
0575 15646 063670 LDA SCLAI YES, (B) = 0
0576 15647 073633 STA SFNSH+1 SET CLEAR INSTRUCTION
0577 15650 000040 CLE SET NO CR/LF
0578 15651 006400 CLB INITIALIZE OUTPUT COUNT
0579 15652 127636 JMP SINIT,I

PAGE 0040 #03 DATA, ADDRESSES, ETC.

0581*
0582* COMMON DRIVER CCNSTANTS AND ADDRESSES
0583*
0584 15653 177765 SM11 DEC -11
0585 15654 177775 SM3 DEC -3
0586 15655 177776 SM2 DEC -2
0587 15656 000002 S.2 DEC 2
0588 15657 000003 S.3 DEC 3
0589 15660 000012 SLNFD OCT 12 LINE FEED
0590 15661 000015 SCRTN OCT 15 CARRIAGE RETURN
0591 15662 000033 SEPDE OCT 33 ESCAPE
0592 15663 000137 SLFTA OCT 137 LEFT ARROW
0593 15664 000175 SOPDE OCT 175 OBSOLETE ALT MODE
0594 15665 000176 SAPDE OCT 176 ALT MODE
0595 15666 000177 SB177 OCT 177 RUBOUT
0596 15667 000200 SB200 OCT 200
0597 15670 002400 SCLAI CLA
0598 15671 033667 SICRI IOR SB200 ADD IN BIT 7
0599*
0600 15672 015673 SCRLA DEF SCRLF
0601 15673 106612 SCRLF OCT 106612
0602*
0603 15674 000000 SBFSA NOP INITIAL BUFFER ADDRESS
0604 15675 000000 SBIDR NOP CURRENT BUFFER ADDRESS
0605 15676 000000 SCCNT NOP HOLDS RECORD LENGTH
0606 15677 000000 SECTC NOP END-OF-TAPE COUNTER
0607*
0608 END
** NO ERRORS*